AFFDL-TR-75-44

VOL. II, PART II

WEAPON SYSTEM COSTING METHODOLOGY FOR AIRCRAFT AIRFRAMES AND BASIC STRUCTURES

Volume II • Estimating Handbook and User's Manual • Part II

GENERAL DYNAMICS CONVAIR DIVISION
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Prepared for
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Air Force Systems Command
Wright-Patterson Air Force Base, Ohio

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This volume provides a detailed description of the function and use of two weapon system costing methodologies for aircraft airframes and basic structures developed for the Air Force Flight Dynamics Laboratory for use in conceptual and preliminary designs phases of weapon system development. The methods are a trade study costing method for detailed cost analysis of trades-off between weight, cost, type of construction and type of material and a system costing method for determing the pro-

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20. Abstract (Continued)

jected cost of a complete airframe within the context of a weapon system development. This volume describes how to make an estimate using either technique and shows the results of a demonstration case.

Tradeoff capability has been provided for a range of alternative structure and material combinations. A technique for independent assessing complexity factor has been developed and demonstrated. Manufacturing costs are separately estimated for the primary elements of substructure: ribs, spars, covers, leading edges, trailing edges, tips, etc. The trade study method provides an iterative capability stemming from a direct interface with design synthesis programs. A detailed cost data base and system for data expansion is provided. The methods are designed for ease in changing cost estimating relationships and estimating coefficients resulting from cost data update.

FOREWORD

This report was prepared by the Convair Division of General Dynamics, San Diego, California, under USAF Contract F33615-73-C-2083. The contract, titled "Weapon System Costing Methodology for Aircraft Airframes and Basic Structures," was initiated under Project 1368, "Advanced Structures for Military Aerospace Vehicles," Task 136802, "Structural Integration for Military Aerospace Vehicles."

The work was administered under the direction of the Air Force Flight Dynamics Laboratory, Structures Division, Wright-Patterson Air Force Base, Ohio, under the direction of Mr. R. N. Mueller (AFFDL/FBRB) as Project Engineer.

This report covers work conducted from July 1972 to February 1975 and was submitted by the author in February 1975, under Air Force Flight Dynamics Laboratory Report No. TR-75-44 as a Final Report. This report includes one additional volume: Volume I, Technical Volume. Both Volume I and II are final technical reports.

The following Interim Technical Report volumes have been issued under this program as AFFDL-TR 73-129:

Volume I: Cost Methods Research & Development
Volume II: Supporting Design Synthesis Programs
Volume III: Cost Data Base
Volume IV: Estimating Techniques Handbook

The principal author and project leader on this program is Mr. R. E. Kenyon, under the administration of Mr. G. E. Vail, Chief of Economic Analysis and Mr. A. Van Duren, Manager of Operations Research. Others who contributed to the studies and who contributed in the preparation of this report include Messrs. J. M. Youngs and R. J. Reid, Economic Analysis; B. H. Oman, W. D. Honeycutt, and T. F. Reed, Mass Properties; L. M. Peterson and G. S. Kruse, Structural Analysis; G. G. Clark, Analytical Programming; and T. Kell, Industrial Engineering.

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INPUT DATA DECK LISTING AND MODEL CARD EXPLANATION

A complete listing of the input data deck is included in this appendix. This includes NAMELIST cards and model cards. This listing is followed by an explanation of the function of each of the various types of model cards used in the COSTC program.

INPUT DATA DECK LISTING

Following is a complete list of the input data cards for the program. The first two pages are the NAMELIST variable cards followed by the model cards.

```
    CARDS   350WNG   HTL   VTL   FLG   NAC   LDS
$SIZE
 W1=70.,CF1=.51,W2=270.,CF2=.99,W3=540.,CF3=1.,W4=1000.,CF4=.640,W5=693.,
 CF5=1.72,W6=250.,CF6=1.,W7=5114.,CF7=3.5,CM1=2.03,CM3=1.,CM4=3.34,CM6=1.,
 CM7=3.5,CN=60.,RN=8.,SNF=31.,SFF=30.,RP=50.,TS4=.1,FF1=1.2,FF2=2.,CB1=1.75,
 WD1=348.7,CC1=2.,CB2=4.,WD2=93.2,CC2=4.5,CB3=4.5,WD3=1135.2,CC3=4.75,CB4=2.7,
 WD4=757.7,CC4=2.5,CB5=2.5,WD5=265.9,CC5=2.7,CB8=3.,WD8=101.2,CC8=2.31,CB9=3.,
 WD9=236.9,CC9=3.,CB16=3.,WD16=956.,CC16=3.,WRRP=44.3,CSO=1.,FSL=10.5,ERL=50.,
 RSL=21.,TS7=.2,FF3=2.5,CM8=3.,AS2=1890.,RMC1=18.,RMC2=18.,RMC3=18.,SF1=2.,
 SF2=5.3,SF3=2.,RMC4=18.,RMC5=18.,RMC6=18.,SF4=3.,SF5=5.3,SF6=3.,RMC7=36.,
 SF7=2.,RMC10=50.,SF10=1.2,RMC11=55.,SF11=1.2,RMC12=55.,SF12=1.2,RMC13=50.,
 SF13=1.2,RMC14=50.,SF14=1.2,RMC17=18.,SF17=5.3,RMC18=50.,SF18=3.,RMC25=40.,
 SF25=2.,FM1=2.5,FM2=1.7,EH=540.,WAMPR=12156.,ECLR=6.56,TMF=7500.,TAM=3.,
 THC=6.26,TFC=5.94,TDC=6.,RQC=6.84,PN1=1.,PN2=30.,PN3=36.,RM=6.29,RT=6.26,
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$CURVE
PC11=.7,PC21=.7,PC31=.95,PC12=.7,PC22=.7,PC32=.95,PC13=.7,PC23=.7,PC33=.95,
PC14=.7,PC24=.7,PC34=.95,PC15=.7,PC25=.7,PC35=.95,PC16=.7,PC26=.7,PC36=.95,
PC17=.7,PC27=.7,PC37=.95,PC18=.7,PC28=.7,PC38=.95,PC19=.7,PC29=.7,PC39=.95,
PC110=.7,PC210=.7,PC310=.95,PC111=.7,PC211=.7,PC311=.95,PC112=.7,PC212=.95,
PC312=.95,PC113=.7,PC213=.7,PC313=.95,PC114=.7,PC214=.7,PC314=.95,PC115=.7,
PC215=.7,PC315=.95,PC116=.7,PC216=.7,PC316=.95.PC117=.7,PC217=.7,PC317=.95,
PC118=.7,PC218=.7,PC318=.95,PC119=.7,PC219=.7,PC319=.95,PC120=.7,PC220=.7,
PC320=.95,PC121=.7,PC221=.7,PC321=.95,
$
$SUMARY
$
$SIZE
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 CB3=0.,WD3=0.,CC3=0.,CB4=0.,WD4=0.,CC4=0.,CB5=0.,WD5=0.,CC5=0.,CB8=0.,WD8=0.,
 CC8=0.,CB9=0.,WD9=0.,CC9=0.,CB16=0.,WD16=0.,CC16=0.,WRRP=0.,CSO=0.,FSL=0.,
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 SF2=0.,SF3=0.,RMC4=0.,RMC5=0.,RMC6=0.,SF4=0.,SF5=0.,SF6=0.,RMC7=0.,SF7=0.,
 RMC10=0.,SF10=0.,RMC11=0.,SF11=0.,RMC12=0.,SF12=0.,RMC13=0.,SF13=0.,RMC14=0.,
 SF14=0.,RMC17=0.,SF17=0.,RMC18=0.,SF18=0.,RMC25=0.,SF25=0.,FM1=0.,FM2=0.,
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$CURVE
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PC319=0.,PC120=0.,PC220=0.,PC320=0.,PC121=0.,PC221=0.,PC321=0.,
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$SUMARY
$
$SIZE
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 CM7=3.5,CN=2.,RN=4.,SNF=6.,SPF=24.,RP=13.,TS4=.1,FF1=1.2,FF2=2.,CB1=1.75,
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 CB17=3.5,
 WD17=244.1,CC17=3.5,WRRP=16.,CSO=1.,FSL=17.,ERL=3.,RSL=15.,TS7=.15,FF3=2.5,
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 ECLR=6.56,TAM=3.,RM=6.29,THC=6.26,TFC=5.94,TDC=6.00,RQC=6.84,RT=6.26,PN1=1.,
 PN2=30.,PN3=86.,PN4=116.,PN6=30.,
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```

```
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PC316=0.,
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$SUMARY
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$SIZE
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 RP=20.,CB1=2.5,WD1=261.3,CC1=2.5,CB2=0.,WD2=0.,CC2=0.,CB4=0.,WD4=0.,CC4=0.,
 CB5=2.2,WD5=426.4,CC5=2.13,CB8=0.,WD8=0.,CC8=0.,CB9=0.,WD9=0.,CC9=0.,CB10=2.,
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 ERL=0.,RSL=0.,TS7=0.,FF7=0.,CM8=3.,AS2=1825.,RMC2=18.,SF1=5.3,SF2=5.3,SF5=5.3,
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$CURVE
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$
$SIZE
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 FF2=0.,CB1=2.26,WD1=3568.,CC1=1.5,CB2=2.32,WD2=1031.1,CC2=1.5,CB3=0.,WD3=0.,
 CC3=0.,
 CB5=0.,WD5=0.,CC5=0.,CB10=0.,WD10=0.,CC10=0.,CB12=0.,WD12=0.,CC12=0.,CB13=0.,
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$CURVE
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PC216=0.,PC316=0.,PC117=0.,PC217=0.,PC317=0.,PC118=0.,PC218=0.,PC318=0.,
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$SIZE
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 CC3=1.3,CB4=1.3,WD4=499.,CC4=1.3,CB5=1.3,WD5=1201.9,CC5=1.3,CB6=1.3,
 WD6=574.2,CC6=1.3,CB7=1.3,WD7=199.7,CC7=1.3,RMC10=320.,SF10=1.,RMC11=320.,
 SF11=1.,RMC12=320.,SF12=1.,RMC13=320.,SF13=1.,RMC14=320.,SF14=1.,RMC15=320.,
 SF15=1.,RMC16=320.,SF16=1.,EH=560.,WAMPR=3856.,TMF=100.,
 CM8=2.,RM=6.29,RT=6.26,
$
$CURVE
PC19=.7,PC29=.7,PC39=.95,PC110=.7,PC210=.7,PC310=.95,PC111=.7,PC211=.7,
PC311=.95,PC112=.7,PC212=.7,PC312=.95,
```

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P
B            (6(3X,F7.0))
1            DTAILSUB- MAJORPRIM-MAJORMATL TOTALTOTALTOTAL
2            FAB  ASSY ASSY ASSY MATL COST LABORLABOR
3            HOURSHOURSHOURSHOURSHOURS  $  HOURS  $    $
F  5  1      W1 WNG*CF1 WNG+W2 WNG*CF2 WNG+W3 WNG*CF3 WNG
F  5  2      W1 FLG*CF1 FLG+W2 FLG*CF2 FLG+W3 FLG*CF3 FLG
F  5  4      W1 HTL*CF1 HTL+W2 HTL*CF2 HTL+W3 HTL*CF3 HTL
F  5  7      W1 VTL*CF1 VTL+W2 VTL*CF2 VTL+W3 VTL*CF3 VTL
            (SUM OF RIB TYPE WEIGHT*COMPLEXITY FACTOR PRODUCTS)
F  5  3      W1 WNG+W2 WNG+W3 WNG
F  5  6      W1 HTL+W2 HTL+W3 HTL
F  5  9      W1 VTL+W2 VTL+W3 VTL
F  5 10      W1 FLG+W2 FLG+W3 FLG
            (SUM OF RIB TYPE WEIGHTS)
F  6  1      W4 WNG*CF4 WNG+W5 WNG*CF5 WNG+W6 WNG*CF6 WNG
F  6  2      W4 FLG*CF4 FLG+W5 FLG*CF5 FLG+W6 FLG*CF6 FLG
F  6  4      W4 HTL*CF4 HTL+W5 HTL*CF5 HTL+W6 HTL*CF6 HTL
F  6  7      W4 VTL*CF4 VTL+W5 VTL*CF5 VTL+W6 VTL*CF6 VTL
            (SUM OF SPAR TYPE WEIGHT*COMPLEXITY FACTOR PRODUCTS)
F  6  3      W4 WNG+W5 WNG+W6 WNG
F  6  6      W4 HTL+W5 HTL+W6 HTL
F  6  9      W4 VTL+W5 VTL+W6 VTL
F  6 10      W4 FLG+W5 FLG+W6 FLG
            (SUM OF SPAR TYPE WEIGHTS)
F  7  1      W7 WNG*CF7 WNG+W8 WNG*CF8 WNG+W9 WNG*CF9 WNG
F  7  2      W7 FLG*CF7 FLG+W8 FLG*CF8 FLG+W9 FLG*CF9 FLG
F  7  4      W7 HTL*CF7 HTL+W8 HTL*CF8 HTL+W9 HTL*CF9 HTL
F  7  7      W7 VTL*CF7 VTL+W8 VTL*CF8 VTL+W9 VTL*CF9 VTL
            (SUM OF COVER TYPE WEIGHT*COMPLEXITY FACTOR PRODUCTS)
F  7  3      W7 WNG+W8 WNG+W9 WNG
F  7  6      W7 HTL+W8 HTL+W9 HTL
F  7  9      W7 VTL+W8 VTL+W9 VTL
F  7 10      W7 FLG+W8 FLG+W9 FLG
            (SUM OF COVER TYPE WEIGHTS)
F  8  1      TS4 WNG*2.0 / .04
F  8  2      TS4 FLG*2.0 / .04
F  8  4      TS4 HTL*2.0 / .04
F  8  7      TS4 VTL*2.0 / .04
F  8  3      TS7 WNG*2.0 / .04
F  8  6      TS7 HTL*2.0 / .04
F  8  9      TS7 VTL*2.0 / .04
F  8 10      TS7 FLG*2.0 / .04
            (JOINT THICKNESS RATIO... 2.*SKIN THICKNESS / .04)
F  9  2      W1 WNG*CM1 WNG+W2 WNG*CM2 WNG+W3 WNG*CM3 WNG
F  9  5      W1 HTL*CM1 HTL+W2 HTL*CM2 HTL+W3 HTL*CM3 HTL
F  9  8      W1 VTL*CM1 VTL+W2 VTL*CM2 VTL+W3 VTL*CM3 VTL
F  9 10      W1 FLG*CM1 FLG+W2 FLG*CM2 FLG+W3 FLG*CM3 FLG
            (SUM RIB WEIGHT *COMPLEXITY FACTORS-SUBASSEMBLY)
F 10  2      W4 WNG*CM4 WNG+W5 WNG*CM5 WNG+W6 WNG*CM6 WNG
F 10  5      W4 HTL*CM4 HTL+W5 HTL*CM5 HTL+W6 HTL*CM6 HTL
F 10  8      W4 VTL*CM4 VTL+W5 VTL*CM5 VTL+W6 VTL*CM6 VTL
F 10 10      W4 FLG*CM4 FLG+W5 FLG*CM5 FLG+W6 FLG*CM6 FLG
            (SUM SPAR WEIGHT *COMPLEXITY FACTORS-SUBASSEMBLY)
F 11  2      W7 WNG*CM7 WNG+W8 WNG*CM8 WNG+W9 WNG*CM9 WNG
F 11  5      W7 HTL*CM7 HTL+W8 HTL*CM8 HTL+W9 HTL*CM9 HTL
F 11  8      W7 VTL*CM7 VTL+W8 VTL*CM8 VTL+W9 VTL*CM9 VTL
F 11 10      W7 FLG*CM7 FLG+W8 FLG*CM8 FLG+W9 FLG*CM9 FLG
            (SUM COVERS WEIGHT *COMPLEXITY FACTORS-SUBASSEMBLY)
F 12  3      W2 WNG**.77*RMC2 WNG*SF2 WNG+W3 WNG**.77*RMC3 WNG*SF3 WNG
```

```
F 12  6    W5 WNG**.77*RMC5 WNG*SF5 WNG+W6 WNG**.77*RMC6 WNG*SF6 WNG
F 12  9    W8 WNG**.77*RMC8 WNG*SF8 WNG+W9 WNG**.77*RMC9 WNG*SF9 WNG
          (RIB,SPAR,COVER COST FOR WNG TYPES 2+3)
F 13  3    W2 HTL**.77*RMC2 HTL*SF2 HTL+W3 HTL**.77*RMC3 HTL*SF3 HTL
F 13  6    W5 HTL**.77*RMC5 HTL*SF5 HTL+W6 HTL**.77*RMC6 HTL*SF6 HTL
F 13  9    W8 HTL**.77*RMC8 HTL*SF8 HTL+W9 HTL**.77*RMC9 HTL*SF9 HTL
          (RIB,SPAR,COVER COST FOR HTL TYPES 2+3)
F 14  3    W2 VTL**.77*RMC2 VTL*SF2 VTL+W3 VTL**.77*RMC3 VTL*SF3 VTL
F 14  6    W5 VTL**.77*RMC5 VTL*SF5 VTL+W6 VTL**.77*RMC6 VTL*SF6 VTL
F 14  9    W8 VTL**.77*RMC8 VTL*CF8 VTL+W9 VTL**.77*RMC9 VTL*SF9 VTL
          (RIB,SPAR,COVER COST FOR VTL TYPES 2+3)
F 15  1    RP WNG**.95*RN WNG**.95+SPE WNG**.95*(SNE WNG+SNI WNG)**.95
F 15  4    RP HTL**.95*RN HTL**.95+SPE HTL**.95*(SNE HTL+SNI HTL)**.95
F 15  7    RP VTL**.95*RN VTL**.95+SPE VTL**.95*(SNE VTL+SNI VTL)**.95
          (RP)**R*(RN)**Q+(SPE**R*(SNE+SNI)**Q = P A R T  A
F 15  8    2.0*((CN WNG + RN WNG + SNE WNG + SNI WNG)**.95)
F 15  9    2.0 * ((CN HTL + RN HTL + SNE HTL + SNI HTL)**.95)
F 15 10    2.0*((CN VTL + RN VTL + SNE VTL + SNI VTL)**.95)
          (HSA2*(CN+RN+SNE+SNI)**Q = P A R T  B
F 16  1    (((5,3)+(6,3)+(7,3))*.20 +(15,8)) * 2.0
          WB*HAS1+PART B *2.0 (TRANSPORTATION + POSITIONING)
F 16  2    (SPE WNG + RP WNG) * 1.216 * (8,1) * 2.0
          (SPE+RP)*HT*TJ4*2.0 (PANEL FIT + TRIM)
F 16  3    (15,1) * 1.238 * 2.0
          PART A *HL*2.0 (ASSY CLAMP + LAYOUT)
F 16  4    (15,1) * .557 * (8,1) * 2.0
          PART A *HD*TJ4*2.0 (HOLE DRILLING)
F 16  5    (15,1) * .810 * (8,1) * FF1 WNG * 2.0
          PART A *HE*TJ4*FF1*2.0 (FINISH OPERATIONS)
F 16  6    (15,1) * .970 * (8,1) * FF2 WNG * 2.0
          PART A *HFI*TJ4*FF2*2.0 (FASTENER INSTALLATION)
F 16  7    ((16,1)+(16,2)+(16,3)+(16,4)+(16,5)+(16,6)) * .68 * FM1 WNG
          TOTAL ASSY LABOR HOURS *AMF1*FM1
          (BOX ASSEMBLY WING)
F 17  1    ((5,6)+(6,6)+(7,6))*.20 +(15,9) * 2.0
          WB*HAS1+PART B *2.0 (TRANSPORTATION + POSITIONING)
F 17  2    (SPE HTL + RP HTL) * 1.216 * (8,4) * 2.0
          (SPE+RP*HT*TJ4*2.0) (PANEL FIT + TRIM)
F 17  3    (15,4) * 1.238 * 2.0
          PART A *HL*2.0 (ASSY CLAMP + LAYOUT)
F 17  4    (15,4) * .557 * (8,4) * 2.0
          PART A *HD*TJ4*2.0 (HOLE FRILLING)
F 17  5    (15,4) * .810 * (8,4) * FF1 HTL * 2.0
          PART A *HE*TJ4*FF1*2.0 (FINISH OPERATIONS)
F 17  6    (15,4) * .970 * (8,4) * FF2 HTL * 2.0
           PART A *HFI*TJ4*FF2*2.0 (FASTENER INSTALLATION)
F 17  7    ((17,1)+(17,2)+(17,3)+(17,4)+(17,5)+(17,6)) * .34 * FM1 HTL
           TOTAL ASSY LABOR HOURS *AMF1*FM1
          (BOX ASSEMBLY HORT TAIL)
F 18  1    ((5,9)+(6,9)+(7,9))*.20 + (15,10)
           WB*HAS1+PART B (TRANSPORTATION + POSITIONING)
F 18  2    (SPE VTL + RP VTL) * 1.216 *  (8,7)
           (SPE+RP)*HT*TJ4 (PANEL FIT + TRIM)
F 18  3    (15,7) * 1.238
           PART A *HL (ASSY CLAMP + LAYOUT)
F 18  4    (15,7) * .557 * (8,7)
           PART A *HD*TJ4 (HOLE DRILLING)
F 18  5    (15,7) * .810 * (8,7) * FF1 VTL
           PART A *HE*TJ4*FF1 (FINISH OPERATIONS)
F 18  6    (15,7) * .970 * (8,7) * FF2 VTL
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              PART A *AMF1*TU4*FF2 (FASTENER INSTALLATION)
F 18   7      ((18,1)+(18,2)+(18,3)+(18,4)+(18,5)+(18,6))* .68 * FM1 VTL
              TOTAL ASSY LABOR HOURS *AMF1*FM1
              (BOX ASSEMBLY VERT TAIL)
F 19   1      W2 FLG**.77*RMC2 FLG*SF2 FLG+W3 FLG**.77*RMC3 FLG*SF3 FLG
F 19   2      W5 FLG**.77*RMC5 FLG*SF5 FLG+W6 FLG**.77*RMC6 FLG*SF6 FLG
F 19   3      W8 FLG**.77*RMC8 FLG*SF8 FLG+W9 FLG**.77*RMC9 FLG*SF9 FLG
              (FRAMES, BULKHEADS, LONGERONS, SKINS, STRINGERS  COSTS)
F 22   1      RP FLG**.95*RN FLG**.95+SPE FLG**.95*(SNE FLG+SNI FLG)**.95
F 22   2      2.0*((CN FLG + RN FLG + SNE FLG + SNI FLG)**.95)
F 22   3      ((5,10)+(6,10)+(7,10))*.20+(22,2)
F 22   4      (SPE FLG + RP FLG) *1.216 * (8,2)
F 22   5      (22,1) * 1.238
F 22   6      (22,1) * .557 * (8,2)
F 22   7      (22,1) * .810 * (8,2) * FF1 FLG
F 22   8      (22,1) * .970 * (8,2) * FF2 FLG
F 22   9      ((22,3)+(22,4)+(22,5)+(22,6)+(22,7)+(22,8))* .68 * FM1 FLG
              (STRUCTURE ASSEMBLY FUSELAGE)
F 24   1      1.0 * (PN2 WNG**.20 -1.)
F 24   2      1.0 * (PN2 HTL**.20 -1.)
F 24   3      1.0 * (PN2 VTL**.20 -1.)
F 24   4      1.0 * (PN2 FLG**.20 -1.)
F 24   5      1.0 * (PN2 NAC**.20 -1.)
F 24   6      1.0 * (PN2 LDG**.20 -1.)
              RDT+E QUANITY CALCULATED HERE
F 25   1      1.0 * (PN2 WNG**.14 -1.)
F 25   2      1.0 * (PN2 HTL**.14 -1.)
F 25   3      1.0 * (PN2 VTL**.14 -1.)
F 25   4      1.0 * (PN2 FLG**.14 -1.)
F 25   5      1.0 * (PN2 NAC**.14 -1.)
F 25   6      1.0 * (PN2 LDG**.14 -1.)
              RDT+E QUANITY CALCULATED HERE
F 26   1      1.0 * (PN4 WNG**.20 - PN2 WNG**.20)
F 26   2      1.0 * (PN4 HTL**.20 - PN2 HTL**.20)
F 26   3      1.0 * (PN4 VTL**.20 - PN2 VTL**.20)
F 26   4      1.0 * (PN4 FLG**.20 - PN2 FLG**.20)
F 26   5      1.0 * (PN4 NAC**.20 - PN2 NAC**.20)
F 26   6      1.0 * (PN4 LDG**.20 - PN2 LDG**.20)
              FIRST PRODUCTION QUANITY CALCULATED HERE
F 27   1      1.0 * (PN4 WNG**.14 - PN2 WNG**.14)
F 27   2      1.0 * (PN4 HTL**.14 - PN2 HTL**.14)
F 27   3      1.0 * (PN4 VTL**.14 - PN2 VTL**.14)
F 27   4      1.0 * (PN4 FLG**.14 - PN2 FLG**.14)
F 27   5      1.0 * (PN4 NAC**.14 - PN2 NAC**.14)
F 27   6      1.0 * (PN4 LDG**.14 - PN2 LDG**.14)
              FIRST PRODUCTION QUANITY CALCULATED HERE
F 28   1      1.0 * (PN6 WNG**.20 - PN2 WNG**.20)
F 28   2      1.0 * (PN6 HTL**.20 - PN2 HTL**.20)
F 28   3      1.0 * (PN6 VTL**.20 - PN2 VTL**.20)
F 28   4      1.0 * (PN6 FLG**.20 - PN2 FLG**.20)
F 28   5      1.0 * (PN6 NAC**.20 - PN2 NAC**.20)
F 28   6      1.0 * (PN6 LDG**.20 - PN2 LDG**.20)
              SECOND PRODUCTION QUANITY CALCULATED HERE
F 29   1      1.0 * (PN6 WNG**.14 - PN2 WNG**.14)
F 29   2      1.0 * (PN6 HTL**.14 - PN2 HTL**.14)
F 29   3      1.0 * (PN6 VTL**.14 - PN2 VTL**.14)
F 29   4      1.0 * (PN6 FLG**.14 - PN2 FLG**.14)
F 29   5      1.0 * (PN6 NAC**.14 - PN2 NAC**.14)
F 29   6      1.0 * (PN6 LDG**.14 - PN2 LDG**.14)
              SECOND PRODUCTION QUANITY CALCULATED HERE
```

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C                          B-58   TEST CASE
C                          USE OF DECIMAL IMPLIES UNITS IN MILLIONS
C
C              FIRST UNIT COST
C
C
C             WING
N 9
T
C      STRUCTURAL BOX
F 31   1    (5,1) / (5,3) * 51.0 * (5,3)**.67
                            HF1            E1
F 31   2    (9,2) / (5,3) * 14.5 * (5,3)**.67
                            HF4            E4
F 31   6    W1 WNG**.77 * RMC1 WNG * SF1 WNG + (12,3)
D         RIBS
F 32   1    (6,1) / (6,3) * 52.0 * (6,3)**.67
                            HF2            E2
F 32   2    (10,2) / (6,3) * 19.0 * (6,3)**.67
                             HF5            E5
F 32   6    W4 WNG**.77 * RMC4 WNG * SF4 WNG + (12,6)
D         SPARS
F 33   1    (7,1) / (7,3) * 11.0 * (7,3)**.67
                            HF3            E3
F 33   2    (11,2) / (7,3) * 7.2 * (7,3)**.67
                             HF6           E6
F 33   6    W7 WNG**.77 * RMC7 WNG * SF7 WNG + (12,9)
D         COVERS
C
F 34   3    (16,1)+(16,2)+(16,3)+(16,4)+(16,5)+(16,6)
F 34   6    (16,7) * 1.0
D         ASSEMBLY
R 35   1  6  3          4  31  1
D              STRUCTURAL BOX SUB-TOTALS
F 36   1    (35,1) * RM WNG
F 36   2    (35,2) * RM WNG
F 36   3    (35,3) * RM WNG
D              LABOR COSTS   ($)
C
C     SECONDARY STRUCTURE
F 38   1     CD1 WNG * 55.0 * WD1 WNG**.67
                      WC1              E7
F 38   2     CC1 WNG * 48.0 * WD1 WNG**.67
                      WF1              F1
F 38   6     WD1 WNG**.77 * RMC10 WNG * SF10 WNG
D         LEADING EDGE
F 39   1     CD2 WNG * 29.0 * WD2 WNG**.67
                      WC2              E8
F 39   2     CC2 WNG * 23.0 * WD2 WNG**.67
                      WF2              F2
F 39   6     WD2 WNG**.77 * RMC11 WNG * SF11 WNG
D         TRAILING EDGE
F 40   1     CD3 WNG * 85. * WD3 WNG**.67
F 40   2     CC3 WNG * 47. * WD3 WNG**.67
F 40   6     WD3 WNG**.77 * RMC12 WNG * SF12 WNG
D         AILERONS
F 41   1     CD4 WNG * 36. * WD4 WNG**.67
F 41   2     CC4 WNG * 34. * WD4 WNG**.67
F 41   6     WD4 WNG**.77 * RMC13 WNG * SF13 WNG
D         FAIRINGS
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F 42  1   CB5 WNG * 60.0 * WD5 WNG**.67
                    WC5             E11
F 42  2   CC5 WNG * 45.0 * WD5 WNG**.67
                    WF5             F5
F 42  6   WD5 WNG**.77 * RMC14 WNG * SF14 WNG
D        TIPS
F 43  1   CB6 WNG * 0.0 * WD6 WNG**.67
F 43  2   CC6 WNG * 0.0 * WD6 WNG**.67
F 43  6   WD6 WNG**.77 * RMC15 WNG * SF15 WNG
D        SPOILERS
F 44  1   CB7 WNG * 46.0 * WD7 WNG**.67
                    WC7             E13
F 44  2   CC7 WNG * 42.0 * WD7 WNG**.67
                    WF7             F7
F 44  6   WD7 WNG**.77 * RMC16 WNG * SF16 WNG
D        FLAPS + FLAPERONS
F 45  1   CB8 WNG * 18. * WD8 WNG**.67
F 45  2   CC8 WNG * 17.5 * WD8 WNG**.67
F 45  6   WD8 WNG**.77 * RMC17 WNG * SF17 WNG
D        ATTACHMENT STRUCTURE
F 46  1   CB9 WNG * 13. * WD9 WNG**.67
F 46  2   CC9 WNG * 28. * WD9 WNG**.67
F 46  6   WD9 WNG**.77 * RMC18 WNG * SF18 WNG
D        ACCESS + OTHER DOORS
F 47  1   CB10 WNG * 0.0 * WD10 WNG**.67
F 47  2   CC10 WNG * 0.0 * WD10 WNG**.67
F 47  6   WD10 WNG**.77 * RMC19 WNG * SF19 WNG
D        AIR INDUCTION
F 48  1   CB11 WNG * 0.0 * WD11 WNG**.67
F 48  2   CC11 WNG * 0.0 * WD11 WNG**.67
F 48  6   WD11 WNG**.77 * RMC20 WNG * SF20 WNG
D        HIGH LIFT DUCTING
F 49  1   CB12 WNG * 0.0 * WD12 WNG**.67
F 49  2   CC12 WNG * 0.0 * WD12 WNG**.67
F 49  6   WD12 WNG**.77 * RMC21 WNG * SF21 WNG
D        SLATS
F 50  1   CB13 WNG * 0.0 * WD13 WNG**.67
F 50  2   CC13 WNG * 0.0 * WD13 WNG**.67
F 50  6   WD13 WNG**.77 * RMC22 WNG * SF22 WNG
D        HINGES, BRACKETS, SEALS
F 51  1   CB14 WNG * 0.0 * WD14 WNG**.67
F 51  2   CC14 WNG * 0.0 * WD14 WNG**.67
F 51  6   WD14 WNG**.77 * RMC23 WNG * SF23 WNG
D        PIVOTS + FOLDS
F 52  1   CB15 WNG * 0.0 * WD15 WNG**.67
F 52  2   CC15 WNG * 0.0 * WD15 WNG**.67
F 52  6   WD15 WNG**.77 * RMC24 WNG * SF24 WNG
D        CENTER SECTION
F 53  1   CB16 WNG * 50.0 * WD16 WNG**.67
                     WC16            E27
F 53  2   CC16 WNG * 30.0 * WD16 WNG**.67
                     WF16            F16
F 53  6   WD16 WNG**.77 * RMC25 WNG * SF25 WNG
N 6
F 53  7   (8,3) * FF3 WNG * 2.48 * CMB WNG
                               HEI
F 53  8   (WRRP WNG*CSO WNG+2.0*FSL WNG+2.*ERL WNG+2.*RSL WNG)**.95*(53,7)
                                                                   WR
F 53  9   A32 WNG * .07 * 2.0
                     HS
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F 53 11    (53,8) * .68 * FM2 WNG
                     AMF2
D        OTHER
N 9
B           (9(3X,F7.0))
F 54  3     (53,8) + (53,9)
F 54  6     (53,11) * 1.0
D        ASSEMBLY
R 55  1  6  3          17 38 1
C
D              SECONDARY STRUCTURE SUB-TOTAL
F 56  1     (55,1) * RM WNG
F 56  2     (55,2) * RM WNG
F 56  3     (55,3) * RM WNG
D              LABOR COSTS  ($)
C
F 57  1     (35,1) + (55,1)
F 57  2     (35,2) + (55,2)
F 57  3     (35,3) + (55,3)
F 57  6     (35,6) + (55,6)
D              WING SUBTOTAL
F 58  1     (57,1) * .1
F 58  2     (57,2) * .1
F 58  3     (57,3) * .1
F 58  6     (57,6) * .1
D              WING REWORK
F 59  1     (57,1) + (58,1)
F 59  2     (57,2) + (58,2)
F 59  3     (57,3) + (58,3)
F 59  4     ((59,1) + (59,2) + (59,3)) * .06
F 59  5     ((59,1) + (59,2) + (59,3)) * .04
F 59  6     (57,6) + (58,6)
F 59 10     (59,2)+(59,3)
D              WING TOTAL
F 60  1     (59,1) * RM WNG
F 60  2     (59,2) * RM WNG
F 60  3     (59,3) * RM WNG
F 60  4     (59,4) * RM WNG
F 60  5     (59,5) * RM WNG
D              LABOR COSTS  ($)
B           (9(3X,F7.0))
F 61  7     (59,1)+(59,2)+(59,3)+(59,4)+(59,5)
F 61  8     (60,1)+(60,2)+(60,3)+(60,4)+(60,5)
F 61  9     (61,8)+(59,6)
D      TOTALS
C
P
B           (6(3X,F7.0))
F 64  1     PN2 WNG * 1.0
D                                   RDT+E COSTS
C
C
C              WING
T
C      STRUCTURAL BOX
Z 65  1 29  31  1       PN1 WNG   PN2 WNG   PC11 WNG
Z 65  2 29  31  2       PN1 WNG   PN2 WNG   PC21 WNG
Z 65  6 29  31  6       PN1 WNG   PN2 WNG   PC31 WNG
D        RIBS
Z 66  1 29  32  1       PN1 WNG   PN2 WNG   PC12 WNG
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Z 66   2 29   32   2       PN1  WNG    PN2  WNG   PC22  WNG
Z 66   6 29   32   6       PN1  WNG    PN2  WNG   PC32  WNG
D          SPARS
Z 67   1 29   33   1       PN1  WNG    PN2  WNG   PC13  WNG
Z 67   2 29   33   2       PN1  WNG    PN2  WNG   PC23  WNG
Z 67   6 29   33   6       PN1  WNG    PN2  WNG   PC33  WNG
D          COVERS
C
Z 68   3 29   34   3       PN1  WNG    PN2  WNG   PC24  WNG
Z 68   6 29   34   6       PN1  WNG    PN2  WNG   PC34  WNG
D          ASSEMBLY
R 69   1  6   3          4  65  1
D              STRUCTURAL BOX SUB-TOTALS
F 70   1     (69,1)  *  RM  WNG
F 70   2     (69,2)  *  RM  WNG
F 70   3     (69,3)  *  RM  WNG
D              LABOR COSTS   ($)
C
C     SECONDARY STRUCTURE
Z 71   1 29   38   1       PN1  WNG    PN2  WNG   PC15  WNG
Z 71   2 29   38   2       PN1  WNG    PN2  WNG   PC25  WNG
Z 71   6 29   38   6       PN1  WNG    PN2  WNG   PC35  WNG
D          LEADING EDGE
Z 72   1 29   39   1       PN1  WNG    PN2  WNG   PC16  WNG
Z 72   2 29   39   2       PN1  WNG    PN2  WNG   PC26  WNG
Z 72   6 29   39   6       PN1  WNG    PN2  WNG   PC36  WNG
D          TRAILING EDGE
Z 73   1 29   40   1       PN1  WNG    PN2  WNG   PC17  WNG
Z 73   2 29   40   2       PN1  WNG    PN2  WNG   PC27  WNG
Z 73   6 29   40   6       PN1  WNG    PN2  WNG   PC37  WNG
D          AILERONS
Z 74   1 29   41   1       PN1  WNG    PN2  WNG   PC18  WNG
Z 74   2 29   41   2       PN1  WNG    PN2  WNG   PC28  WNG
Z 74   6 29   41   6       PN1  WNG    PN2  WNG   PC38  WNG
D          FAIRINGS
Z 75   1 29   42   1       PN1  WNG    PN2  WNG   PC19  WNG
Z 75   2 29   42   2       PN1  WNG    PN2  WNG   PC29  WNG
Z 75   6 29   42   6       PN1  WNG    PN2  WNG   PC39  WNG
D          TIPS
Z 76   1 29   43   1       PN1  WNG    PN2  WNG PC110  WNG
Z 76   2 29   43   2       PN1  WNG    PN2  WNG PC210  WNG
Z 76   6 29   43   6       PN1  WNG    PN2  WNG PC310  WNG
D          SPOILERS
Z 77   1 29   44   1       PN1  WNG    PN2  WNG PC111  WNG
Z 77   2 29   44   2       PN1  WNG    PN2  WNG PC211  WNG
Z 77   6 29   44   6       PN1  WNG    PN2  WNG PC311  WNG
D          FLAPS + FLAPERONS
Z 78   1 29   45   1       PN1  WNG    PN2  WNG PC112  WNG
Z 78   2 29   45   2       PN1  WNG    PN2  WNG PC212  WNG
Z 78   6 29   45   6       PN1  WNG    PN2  WNG PC312  WNG
D          ATTACHMENT STRUCTURE
Z 79   1 29   46   1       PN1  WNG    PN2  WNG PC113  WNG
Z 79   2 29   46   2       PN1  WNG    PN2  WNG PC213  WNG
Z 79   6 29   46   6       PN1  WNG    PN2  WNG PC313  WNG
D          ACCESS + OTHER DOORS
Z 80   1 29   47   1       PN1  WNG    PN2  WNG PC114  WNG
Z 80   2 29   47   2       PN1  WNG    PN2  WNG PC214  WNG
Z 80   6 29   47   6       PN1  WNG    PN2  WNG PC314  WNG
D          AIR INDUCTION
Z 81   1 29   48   1       PN1  WNG    PN2  WNG PC115  WNG
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Z 81   2 29   48   2        PN1 WNG    PN2 WNG PC215 WNG
Z 81   6 29   48   6        PN1 WNG    PN2 WNG PC315 WNG
D        HIGH LIFT DUCTING
Z 82   1 29   49   1        PN1 WNG    PN2 WNG PC116 WNG
Z 82   2 29   49   2        PN1 WNG    PN2 WNG PC216 WNG
Z 82   6 29   49   6        PN1 WNG    PN2 WNG PC316 WNG
D        SEALS
Z 83   1 29   50   1        PN1 WNG    PN2 WNG PC117 WNG
Z 83   2 29   50   2        PN1 WNG    PN2 WNG PC217 WNG
Z 83   6 29   50   6        PN1 WNG    PN2 WNG PC317 WNG
D        HINGES, BRACKETS, SEALS
Z 84   1 29   51   1        PN1 WNG    PN2 WNG PC118 WNG
Z 84   2 29   51   2        PN1 WNG    PN2 WNG PC218 WNG
Z 84   6 29   51   6        PN1 WNG    PN2 WNG PC318 WNG
D        PIVOTS + FOLDS
Z 85   1 29   52   1        PN1 WNG    PN2 WNG PC119 WNG
Z 85   2 29   52   2        PN1 WNG    PN2 WNG PC219 WNG
Z 85   6 29   52   6        PN1 WNG    PN2 WNG PC319 WNG
D        CENTER SECTION
Z 86   1 29   53   1        PN1 WNG    PN2 WNG PC120 WNG
Z 86   2 29   53   2        PN1 WNG    PN2 WNG PC220 WNG
Z 86   6 29   53   6        PN1 WNG    PN2 WNG PC320 WNG
D        OTHER
Z 87   3 29   54   3        PN1 WNG    PN2 WNG PC221 WNG
Z 87   6 29   54   6        PN1 WNG    PN2 WNG PC321 WNG
D        ASSEMBLY
R 88   1  6  3          17 71 1
C
D            SECONDARY STRUCTURE SUB-TOTAL
F 89   1    (88,1) * RM WNG
F 89   2    (88,2) * RM WNG
F 89   3    (88,3) * RM WNG
D            LABOR COSTS  ($)
C
F 90   1    (89,1) + (88,1)
F 90   2    (89,2) + (88,2)
F 90   3    (89,3) + (88,3)
F 90   6    (89,6) + (88,6)
D            WING SUBTOTAL
F 91   1    (90,1) * .1
F 91   2    (90,2) * .1
F 91   3    (90,3) * .1
F 91   6    (90,6) * .1
D            WING REWORK
F 92   1    (90,1) + (91,1)
F 92   2    (90,2) + (91,2)
F 92   3    (90,3) + (91,3)
F 92   4    ((92,1) + (92,2) + (92,3)) * .08
F 92   5    ((92,1) + (92,2) + (92,3)) * .04
F 92   6    (90,6) + (91,6)
D            WING TOTAL
F 93   1    (92,1) * RM WNG
F 93   2    (92,2) * RM WNG
F 93   3    (92,3) * RM WNG
F 93   4    (92,4) * RM WNG
F 93   5    (92,5) * RM WNG
D            LABOR COSTS  ($)
B           (9(3X,-6PF7.4))
F 94   7    (92,1)+(92,2)+(92,3)+(92,4)+(92,5)
F 94   8    (93,1)+(93,2)+(93,3)+(93,4)+(93,5)
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```
F 94   9    (94,8)+(92,6)
D     TOTALS
C
P
B          (6(3X,F7.0))
C            FIRST UNIT COST
C
C
C           HORIZONTAL
T
C     STRUCTURAL BOX
F100   1    (5,4) / (5,6) * 51.0 * (5,6)**.67
                            HF1             E1
F100   2    (9,5) / (5,6) * 14.5 * (5,6)**.67
                            HF4             E4
F100   6    W1 HTL**.77 * RMC1 HTL * SF1 HTL + (13,3)
D        RIBS
F101   1    (6,4) / (6,6) * 52.0 * (6,6)**.67
                            HF2             E2
F101   2    (10,5) / (6,6) * 19.0 * (6,6)**.67
                             HF5             E5
F101   6    W4 HTL**.77 * RMC4 HTL * SF4 HTL + (13,6)
D        SPARS
F102   1    (7,4) / (7,6) * 11.0 * (7,6)**.67
                            HF3             E3
F102   2    (11,5) / (7,6) * 7.2 * (7,6)**.67
                             HF6            E6
F102   6    W7 HTL**.77 * RMC7 HTL * SF7 HTL + (13,9)
D        COVERS
C
F103   3    (17,1)+(17,2)+(17,3)+(17,4)+(17,5)+(17,6)
F103   6    (17,7) * 1.0
D        ASSEMBLY
R104   1  6  3        4 100 1
D           STRUCTURAL BOX SUB-TOTALS
F105   1    (104,1) * 14.0
F105   2    (104,2) * 14.0
F105   3    (104,3) * 14.0
D           LABOR COSTS  ($)
C
C     SECONDARY STRUCTURE
F106   1    CB1 HTL * 55.0 * WD1 HTL**.67
                     WC1            E7
F106   2    CC1 HTL * 46.0 * WD1 HTL**.67
                     WF1            F1
F106   6    WD1 HTL**.77 * RMC10 HTL * SF10 HTL
D        LEADING EDGE
F107   1    CB2 HTL * 29.0 * WD2 HTL**.67
                     WC2            E8
F107   2    CC2 HTL * 23.0 * WD2 HTL**.67
                     WF2            F2
F107   6    WD2 HTL**.77 * RMC11 HTL * SF11 HTL
D        TRAILING EDGE
F108   1    CB4 HTL * 36.0 * WD4 HTL**.67
                     WC4            E
F108   2    CC4 HTL * 34.0 * WD4 HTL**.67
                     WF4            F
F108   6    WD4 HTL**.77 * RMC13 HTL * SF13 HTL
D        FAIRINGS
F109   1    CB5 HTL * 60.0 * WD5 HTL**.67
```

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                       WC5                         E11
F109  2    CC5 HTL * 45.0 * WD5 HTL**.67
                       WF5                         F5
F109  6    WC5 HTL**.77 * RMC14 HTL * SF14 HTL
D        TIPS
F110  1    CB8 HTL * 18.0 * WD8 HTL**.67
                       WC8                         E19
F110  2    CC8 HTL * 17.5 * WD8 HTL**.67
                       WF8                         F8
F110  6    WD8 HTL**.77 * RMC17 HTL * SF17 HTL
D        ATTACHMENT STRUCTURE
F111  1    CB9 HTL * 13.0 * WD9 HTL**.67
                       WC9                         E20
F111  2    CC9 HTL * 28.0 * WD9 HTL**.67
                       WF9                         F9
F111  6    WD9 HTL**.77 * RMC18 HTL * SF18 HTL
D        ACCESS + OTHER DOORS
F112  1    CB13 HTL * 25.0 * WD13 HTL**.67
                       WC13                        E
F112  2    CC13 HTL * 21.0 * WD13 HTL**.67
                       WF13                        F
F112  6    WD13 HTL**.77 * RMC22 HTL * SF22 HTL
D        HINGES, BRACKETS, SEALS
F113  1    CB14 HTL * 10.0 * WD14 HTL**.67
                       WC14                        E
F113  2    CC14 HTL * 10.0 * WD14 HTL**.67
                       WF14                        F
F113  6    WD14 HTL**.77 * RMC23 HTL * SF23 HTL
D        PIVOTS + FOLDS
F114  1    CB15 HTL * 00.0 * WD15 HTL**.67
                       WC15                        E
F114  2    CC15 HTL * 00.0 * WD15 HTL**.67
                       WF15                        F
F114  6    WD15 HTL**.77 * RMC24 HTL * SF24 HTL
D        CENTER SECTION
F115  1    CB16 HTL * 67.0 * WD16 HTL**.67
                       WC16                        E9
F115  2    CC16 HTL * 67.0 * WD16 HTL**.67
                       WF16                        F3
F115  6    WD16 HTL**.77 * RMC25 HTL * SF25 HTL
D        ELEVATORS
F116  1    CB17 HTL * 5.5 * WD17 HTL**.67
                       WC17                        E28
F116  2    CC17 HTL * 5.5 * WD17 HTL**.67
                       WF17                        F17
F116  6    WD17 HTL**.77 * RMC26 HTL * SF26 HTL
N 6
F116  7    (8,6) * FF3 HTL * 2.48 * CMB HTL
                                 HE
F116  8    (WRRP HTL*CSO HTL+2.*FSL HTL+2.*ERL HTL+2.*RSL HTL)**.67*(116,7)
                                                                       WR
F116  9    (116,8) * .68 * FM2 HTL
                  AMF4
F116 10    AS2 HTL * .07 * 2.0
                  HS
D        BALANCE WEIGHTS
N 9
B          (9(3X,F7.0))
F117  3    (116,8) + (116,10)
F117  6    (116,9) * 1.0
```

```
D        ASSEMBLY
R118   1   6   3         12  106 1
C
D            SECONDARY STRUCTURE SUB-TOTAL
F119   1    (118,1)  *  RM  HTL
F119   2    (118,2)  *  RM  HTL
F119   3    (118,3)  *  RM  HTL
F119   4    (118,4)  *  RM  HTL
F119   5    (118,5)  *  RM  HTL
D            LABOR COSTS   ($)
C
F120   1    (104,1)  +  (118,1)
F120   2    (104,2)  +  (118,2)
F120   3    (104,3)  +  (118,3)
F120   6    (104,6)  +  (118,6)
D            HORIZONTAL SUB-TOTAL
F121   1    (120,1)  *  .1
F121   2    (120,2)  *  .1
F121   3    (120,3)  *  .1
F121   6    (120,6)  *  .1
D            HORIZONTAL REWORK
F122   1    (120,1)  +  (121,1)
F122   2    (120,2)  +  (121,2)
F122   3    (120,3)  +  (121,3)
F122   4    ((122,1)+(122,2)+(122,3))  *  .08
F122   5    ((122,1)+(122,2)+(122,3))  *  .04
F122   6    (120,6)  +  (121,6)
F122  10    (122,2)+(122,3)
D            HORIZONTAL TOTAL
F123   1    (122,1)  *  RM  HTL
F123   2    (122,2)  *  RM  HTL
F123   3    (122,3)  *  RM  HTL
F123   4    (122,4)  *  RM  HTL
F123   5    (122,5)  *  RM  HTL
D            LABOR COSTS   ($)
F124   7    (122,1)+(122,2)+(122,3)+(122,4)+(122,5)
F124   8    (123,1)+(123,2)+(123,3)+(122,4)+(123,5)
F124   9    (124,8)+(122,6)
D     TOTALS
P
F125   1    FN2 HTL  *  1.0
D                                    RDT+E  COSTS
C
C
C            HORIZONTAL
T
C     STRUCTURAL BOX
Z126   1  29  100   1       PN1  HTL    PN2  HTL    PC11  HTL
Z126   2  29  100   2       PN1  HTL    PN2  HTL    PC21  HTL
Z126   6  29  100   6       PN1  HTL    PN2  HTL    PC31  HTL
D          RIBS
Z127   1  29  101   1       PN1  HTL    PN2  HTL    PC12  HTL
Z127   2  29  101   2       PN1  HTL    PN2  HTL    PC22  HTL
Z127   6  29  101   6       PN1  HTL    PN2  HTL    PC32  HTL
D          SPARS
Z128   1  29  102   1       PN1  HTL    PN2  HTL    PC13  HTL
Z128   2  29  102   2       PN1  HTL    PN2  HTL    PC23  HTL
Z128   6  29  102   6       PN1  HTL    PN2  HTL    PC33  HTL
D          COVERS
C
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Z129   3 29 103   3        PN1 HTL    PN2 HTL   PC24 HTL
Z129   6 29 103   6        PN1 HTL    PN2 HTL   PC34 HTL
D          ASSEMBLY
R130   1   0   3         4 126 1
D              STRUCTURAL BOX SUB-TOTALS
F131   1       (130,1) * RM HTL
F131   2       (130,2) * RM HTL
F131   3       (130,3) * RM HTL
F131   4       (130,4) * RM HTL
F131   5       (130,5) * RM HTL
D              LABOR COSTS   ($)
C
C      SECONDARY STRUCTURE
Z132   1 29 106   1        PN1 HTL    PN2 HTL   PC15 HTL
Z132   2 29 106   2        PN1 HTL    PN2 HTL   PC25 HTL
Z132   6 29 106   6        PN1 HTL    PN2 HTL   PC35 HTL
D          LEADING EDGE
Z133   1 29 107   1        PN1 HTL    PN2 HTL   PC16 HTL
Z133   2 29 107   2        PN1 HTL    PN2 HTL   PC26 HTL
Z133   6 29 107   6        PN1 HTL    PN2 HTL   PC36 HTL
D          TRAILING EDGE
Z134   1 29 108   1        PN1 HTL    PN2 HTL   PC17 HTL
Z134   2 29 108   2        PN1 HTL    PN2 HTL   PC27 HTL
Z134   6 29 108   6        PN1 HTL    PN2 HTL   PC37 HTL
D          FAIRINGS
Z135   1 29 109   1        PN1 HTL    PN2 HTL   PC18 HTL
Z135   2 29 109   2        PN1 HTL    PN2 HTL   PC28 HTL
Z135   6 29 109   6        PN1 HTL    PN2 HTL   PC38 HTL
D          TIPS
Z136   1 29 110   1        PN1 HTL    PN2 HTL   PC19 HTL
Z136   2 29 110   2        PN1 HTL    PN2 HTL   PC29 HTL
Z136   6 29 110   6        PN1 HTL    PN2 HTL   PC39 HTL
D          ATTACHMENT STRUCTURE
Z137   1 29 111   1        PN1 HTL    PN2 HTL PC110 HTL
Z137   2 29 111   2        PN1 HTL    PN2 HTL PC210 HTL
Z137   6 29 111   6        PN1 HTL    PN2 HTL PC310 HTL
D          ACCESS + OTHER DOORS
Z138   1 29 112   1        PN1 HTL    PN2 HTL PC111 HTL
Z138   2 29 112   2        PN1 HTL    PN2 HTL PC211 HTL
Z138   6 29 112   6        PN1 HTL    PN2 HTL PC311 HTL
D          HINGES, BRACKETS, SEALS
Z139   1 29 113   1        PN1 HTL    PN2 HTL PC112 HTL
Z139   2 29 113   2        PN1 HTL    PN2 HTL PC212 HTL
Z139   6 29 113   6        PN1 HTL    PN2 HTL PC312 HTL
D          PIVOTS + FOLDS
Z140   1 29 114   1        PN1 HTL    PN2 HTL PC113 HTL
Z140   2 29 114   2        PN1 HTL    PN2 HTL PC213 HTL
Z140   6 29 114   6        PN1 HTL    PN2 HTL PC313 HTL
D          CENTER SECTION
Z141   1 29 115   1        PN1 HTL    PN2 HTL PC114 HTL
Z141   2 29 115   2        PN1 HTL    PN2 HTL PC214 HTL
Z141   6 29 115   6        PN1 HTL    PN2 HTL PC314 HTL
D          ELEVATORS
Z142   1 29 116   1        PN1 HTL    PN2 HTL PC115 HTL
Z142   2 29 116   2        PN1 HTL    PN2 HTL PC215 HTL
Z142   6 29 116   6        PN1 HTL    PN2 HTL PC315 HTL
D          BALANCE WEIGHTS
Z143   3 29 117   3        PN1 HTL    PN2 HTL PC216 HTL
Z143   6 29 117   6        PN1 HTL    PN2 HTL PC316 HTL
D          ASSEMBLY
```

```
R144  1   6   3          12 132 1
C
D            SECONDARY STRUCTURE SUB-TOTAL
F145  1    (144,1) * RM HTL
F145  2    (144,2) * RM HTL
F145  3    (144,3) * RM HTL
D           LABOR COSTS  ($)
C
F146  1    (130,1) + (144,1)
F146  2    (130,2) + (144,2)
F146  3    (130,3) + (144,3)
F146  6    (130,6) + (144,6)
C           HORIZONTAL SUBTOTAL
F147  1    (146,1) * .1
F147  2    (146,2) * .1
F147  3    (146,3) * .1
F147  6    (146,6) * .1
D           HORIZONTAL REWORK
F148  1    (146,1) + (147,1)
F148  2    (146,2) + (147,2)
F148  3    (146,3) + (147,3)
F148  4    ((148,1)+(148,2)+(148,3)) * .08
F148  5    ((148,1)+(148,2)+(148,3)) * .04
F148  6    (146,6) + (147,6)
D           HORIZONTAL TOTAL
F149  1    (148,1) * RM HTL
F149  2    (148,2) * RM HTL
F149  3    (148,3) * RM HTL
F149  4    (148,4) * RM HTL
F149  5    (148,5) * RM HTL
D           LABOR COSTS  ($)
B          (9(3X,-6PF7.4))
F150  7    (148,1)+(148,2)+(148,3)+(148,4)+(148,5)
F150  8    (149,1)+(149,2)+(149,3)+(149,4)+(148,5)
F150  9    (150,8)+(148,6)
D     TOTALS
C
P
B          (6(3X,F7.0))
C            FIRST UNIT COST
C
C
C           VERTICAL
T
C     STRUCTURAL BOX
F151  1    (5,7) / (5,9) * 51.0 * (5,9)**.67
                             HF1            E
F151  2    (9,8) / (5,9) * 14.5 * (5,9)**.67
                             HF4            E
F151  6    W1 VTL**.77 * RMC1 VTL * SF1 VTL + (14,5)
D         RIBS
F152  1    (6,7) / (6,9) * 52.0 * (6,9)**.67
                             HF2            E
F152  2    (10,8) / (6,9) * 19.0 * (6,9)**.67
                              HF5            E
F152  6    W4 VTL**.77 * RMC4 VTL * SF4 VTL + (14,6)
D         SPARS
F153  1    (7,7) / (7,9) * 11.0 * (7,9)**.67
                             HF3            E
F153  2    (11,8) / (7,9) * 7.2 * (7,9)**.67
```

```
                                     HFG              L
F153  6    W7 VTL**.77 * RMC7 VTL * SF7 VTL + (14,9)
D        COVERS
C
F154  3    (18,1)+(18,2)+(18,3)+(18,4)+(18,5)+(18,6)
F154  6    (18,7) * 1.0
D        ASSEMBLY
R155  1  6  3        4 151  1
D           STRUCTURAL BOX SUB-TOTALS
F156  1    (155,1) * RM VTL
F156  2    (155,2) * RM VTL
F156  3    (155,3) * RM VTL
D           LABOR COSTS  ($)
C
C     SECONDARY STRUCTURE
F158  1    CB1 VTL * 55.0 * WD1 VTL**.67
                    WC1             E
F158  2    CC1 VTL * 48.0 * WD1 VTL**.67
                    WF1             F
F158  6    WD1 VTL**.77 * RMC10 VTL * SF10 VTL
D        LEADING EDGE
F159  1    CB2 VTL * 0.0 * WD2 VTL**.67
F159  2    CC2 VTL * 0.0 * WD2 VTL**.67
F159  6    WD2 VTL**.77 * RMC11 VTL * SF11 VTL
D        TRAILING EDGE
F160  1    CB4 VTL * 36. * WD4 VTL**.67
F160  2    CC4 VTL * 34. * WD4 VTL**.67
F160  6    WD4 VTL**.77 * RMC13 VTL * SF13 VTL
D        FAIRING
F161  1    CB5 VTL * 60.0 * WD5 VTL**.67
                    WC5             E
F161  2    CC5 VTL * 45.0 * WD5 VTL**.67
                    WF5             F
F161  6    WD5 VTL**.77 * RMC14 VTL * SF14 VTL
D        TIPS
F162  1    CB8 VTL * 18. * WD8 VTL**.67
F162  2    CC8 VTL * 17.5 * WD8 VTL**.67
F162  6    WD8 VTL**.77 * RMC17 VTL * SF17 VTL
D        ATTACHMENT STRUCTURE
F163  1    CB9 VTL * 13. * WD9 VTL**.67
F163  2    CC9 VTL * 28. * WD9 VTL**.67
F163  6    WD9 VTL**.77 * RMC18 VTL * SF18 VTL
D        ACCESS + OTHER DOORS
F164  1    CB13 VTL * 25. * WD13 VTL**.67
F164  2    CC13 VTL * 21. * WD13 VTL**.67
F164  6    WD13 VTL**.77 * RMC22 VTL * SF22 VTL
D        HINGES, BRACKETS, SEALS
F165  1    CB17 VTL * 22.0 * WD17 VTL**.67
                    WC17            E
F165  2    CC17 VTL * 40.0 * WD17 VTL**.67
                    WF17            E
F165  6    WD17 VTL**.77 * RMC26 VTL * SF26 VTL
N 6
F165  7    (6,9) * FF3 VTL * 2.48 * CMB VTL
                                  HEI
F165  8    (WRRP VTL+FSL VTL+ERL VTL+RSL VTL)**.95 * (165,7)
                                                 WR
F165  9    (165,8) * .68 * FM2 VTL
                    AMF2
F165 10    AS2 VTL * .07 * 2.0
```

```
D         MOLDER
N 9
D          (9(3X,F7.0))
F166  5    (165,8) + (165,10)
F166  6    (165,9) * 1.0
D          ASSEMBLY
R167  1  0  3          9 158 1
C
D          SECONDARY STRUCTURE SUB-TOTAL
F168  1    (167,1) * RM VTL
F168  2    (167,2) * RM VTL
F168  3    (167,3) * RM VTL
D           LABOR COSTS  ($)
C
F169  1    (155,1) + (167,1)
F169  2    (155,2) + (167,2)
F169  3    (155,3) + (167,3)
F169  6    (155,6) + (167,6)
D           VERTICAL SUB-TOTAL
F170  1    (169,1) * .1
F170  2    (169,2) * .1
F170  3    (169,3) * .1
F170  6    (169,6) * .1
D           VERTICAL REWORK
F171  1    (169,1) + (170,1)
F171  2    (169,2) + (170,2)
F171  3    (169,3) + (170,3)
F171  4    ((171,1)+(171,2)+(171,3)) * .08
F171  5    ((171,1)+(171,2)+(171,3)) * .04
F171  6    (169,6) + (170,6)
F171 10    (171,2)+(171,3)
D           VERTICAL TOTAL
F172  1    (171,1) * RM VTL
F172  2    (171,2) * RM VTL
F172  3    (171,3) * RM VTL
F172  4    (171,4) * RM VTL
F172  5    (171,5) * RM VTL
D           LABOR COSTS  ($)
F173  7    (171,1)+(171,2)+(171,3)+(171,4)+(171,5)
F173  8    (172,1)+(172,2)+(172,3)+(172,4)+(172,5)
F173  9    (173,8)+(171,6)
D     TOTALS
C
P
F174  1   PN2 VTL * 1.0
D                               RDT+E COSTS
C
C
C           VERTICAL
T
C     STRUCTURAL BOX
Z175  1 29 151  1      PN1 VTL    PN2 VTL   PC11 VTL
Z175  2 29 151  2      PN1 VTL    PN2 VTL   PC21 VTL
Z175  6 29 151  6      PN1 VTL    PN2 VTL   PC31 VTL
D        RIBS
Z176  1 29 152  1      PN1 VTL    PN2 VTL   PC12 VTL
Z176  2 29 152  2      PN1 VTL    PN2 VTL   PC22 VTL
Z176  6 29 152  6      PN1 VTL    PN2 VTL   PC32 VTL
D        SPARS
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Z177   1 29 155  1      PN1 VTL   PN2 VTL   PC13 VTL
Z177   2 29 155  2      PN1 VTL   PN2 VTL   PC23 VTL
Z177   6 29 155  6      PN1 VTL   PN2 VTL   PC33 VTL
D        COVERS
C
Z178   3 29 154  3      PN1 VTL   PN2 VTL   PC24 VTL
Z178   6 29 154  6      PN1 VTL   PN2 VTL   PC34 VTL
D        ASSEMBLY
R179   1  0  3        4 175 1
D           STRUCTURAL BOX SUB-TOTALS
F180   1   (179,1) * RM VTL
F180   2   (179,2) * RM VTL
F180   3   (179,3) * RM VTL
D           LABOR COSTS  ($)
C
C      SECONDARY STRUCTURE
Z181   1 29 158  1      PN1 VTL   PN2 VTL   PC15 VTL
Z181   2 29 158  2      PN1 VTL   PN2 VTL   PC25 VTL
Z181   6 29 158  6      PN1 VTL   PN2 VTL   PC35 VTL
D        LEADING EDGE
Z182   1 29 159  1      PN1 VTL   PN2 VTL   PC16 VTL
Z182   2 29 159  2      PN1 VTL   PN2 VTL   PC26 VTL
Z182   6 29 159  6      PN1 VTL   PN2 VTL   PC36 VTL
D        TRAILING EDGE
Z183   1 29 160  1      PN1 VTL   PN2 VTL   PC17 VTL
Z183   2 29 160  2      PN1 VTL   PN2 VTL   PC27 VTL
Z183   6 29 160  6      PN1 VTL   PN2 VTL   PC37 VTL
D        FAIRING
Z184   1 29 161  1      PN1 VTL   PN2 VTL   PC18 VTL
Z184   2 29 161  2      PN1 VTL   PN2 VTL   PC28 VTL
Z184   6 29 161  6      PN1 VTL   PN2 VTL   PC38 VTL
D        TIPS
Z185   1 29 162  1      PN1 VTL   PN2 VTL   PC19 VTL
Z185   2 29 162  2      PN1 VTL   PN2 VTL   PC29 VTL
Z185   6 29 162  6      PN1 VTL   PN2 VTL   PC39 VTL
D        ATTACHMENT STRUCTURE
Z186   1 29 163  1      PN1 VTL   PN2 VTL PC110 VTL
Z186   2 29 163  2      PN1 VTL   PN2 VTL PC210 VTL
Z186   6 29 163  6      PN1 VTL   PN2 VTL PC310 VTL
D        ACCESS + OTHER DOOR
Z187   1 29 164  1      PN1 VTL   PN2 VTL PC111 VTL
Z187   2 29 164  2      PN1 VTL   PN2 VTL PC211 VTL
Z187   6 29 164  6      PN1 VTL   PN2 VTL PC311 VTL
D        HINGES, BRACKETS, SEALS
Z188   1 29 165  1      PN1 VTL   PN2 VTL PC112 VTL
Z188   2 29 165  2      PN1 VTL   PN2 VTL PC212 VTL
Z188   6 29 165  6      PN1 VTL   PN2 VTL PC312 VTL
D        RUDDER
Z189   3 29 166  3      PN1 VTL   PN2 VTL PC213 VTL
Z189   6 29 166  6      PN1 VTL   PN2 VTL PC313 VTL
D        ASSEMBLY
R190   1  0  3        9 181 1
C
D           SECONDARY STRUCTURE SUB-TOTAL
F191   1   (190,1) * RM VTL
F191   2   (190,2) * RM VTL
F191   3   (190,3) * RM VTL
D           LABOR COSTS  ($)
C
F192   1   (179,1) + (190,1)
```

```
F192  2   (179,2) + (190,2)
F192  3   (179,3) + (190,3)
F192  6   (179,6) + (190,6)
D          VERTICAL SUBTOTAL
F193  1   (192,1) * .1
F193  2   (192,2) * .1
F193  3   (192,3) * .1
F193  6   (192,6) * .1
D          VERTICAL REWORK
F194  1   (192,1) + (193,1)
F194  2   (192,2) + (193,2)
F194  3   (192,3) + (193,3)
F194  4   ((194,1)+(194,2)+(194,3)) * .08
F194  5   ((194,1)+(194,2)+(194,3)) * .04
F194  6   (192,6) + (193,6)
D          VERTICAL TOTAL
F195  1   (194,1) * RM VTL
F195  2   (194,2) * RM VTL
F195  3   (194,3) * RM VTL
F195  4   (194,4) * RM VTL
F195  5   (194,5) * RM VTL
D          LABOR COSTS  ($)
B         (9(3X,-6PF7.4))
F196  7   (194,1)+(194,2)+(194,3)+(194,4)+(194,5)
F196  8   (195,1)+(195,2)+(195,3)+(195,4)+(195,5)
F196  9   (196,8)+(194,6)
D     TOTALS
C
P
B         (6(3X,F7.0))
C           FIRST UNIT COST
C
C
C          FUSELAGE
T
C     BASIC STRUCTURE
F201  1    (5,2) / (5,10) * 100.0 * (5,10)**.67
F201  2    (9,10) / (5,10) * 65.0 * (5,10)**.67
F201  6    W1 FLG**.77 * RMC1 FLG * SF1 FLG + (19,1)
D        FRAMES + BULKHEADS
F202  1    (6,2) / (6,10) * 75.0 * (6,10)**.67
F202  2    (10,10) / (6,10) * 40.0 * (6,10)**.67
F202  6    W4 FLG**.77 * RMC4 FLG * SF4 FLG + (19,2)
D        LONGERONS
F203  1    (7,2) / (7,10) * 32.0 * (7,10)**.67
F203  2    (11,10) / (7,10) * 47.0 * (7,10)**.67
F203  6    W7 FLG**.77 * RMC7 FLG * SF7 FLG + (19,3)
D        SKINS + STRINGERS
C
F204  3    (22,3)+(22,4)+(22,5)+(22,6)+(22,7)+(22,8)
F204  6    (22,9) * 1.0
D        ASSEMBLY
R205  1  6  3        4 201 1
D          BASIC STRUCTURE SUB-TOTALS
F206  1   (205,1) * RM FLG
F206  2   (205,2) * RM FLG
F206  3   (205,3) * RM FLG
D          LABOR COSTS  ($)
C
C     SECONDARY STRUCTURE
```

```
F208  1   CB1 FLG * 60.0 * WD1 FLG**.67
F208  2   CC1 FLG * 35.0 * WD1 FLG**.67
F208  6   WD1 FLG**.77 * RMC10 FLG * SF10 FLG
D         COCKPIT
F209  1   CB2 FLG * 43.0 * WD2 FLG**.67
F209  2   CC2 FLG * 46.0 * WD2 FLG**.67
F209  6   WD2 FLG**.77 * RMC11 FLG * SF11 FLG
D         NOSELDG GEAR DOOR + BOX
F210  1   CB3 FLG * 60.0 * WD3 FLG**.67
F210  2   CC3 FLG * 40.0 * WD3 FLG**.67
F210  6   WD3 FLG**.77 * RMC12 FLG * SF12 FLG
D         WING REACTION BOX
F211  1   CB4 FLG * 60.0 * WD4 FLG**.67
F211  2   CC4 FLG * 40.0 * WD4 FLG**.67
F211  6   WD4 FLG**.77 * RMC13 FLG * SF13 FLG
D         TAIL ATTACHMENT
F212  1   CB5 FLG * 30.0 * WD5 FLG**.67
F212  2   CC5 FLG * 40.0 * WD5 FLG**.67
F212  6   WD5 FLG**.77 * RMC14 FLG * SF14 FLG
D         WINDSHIELD + CANOPY
F213  1   CB6 FLG * 28.0 * WD6 FLG**.67
F213  2   CC6 FLG * 32.0 * WD6 FLG**.67
F213  6   WD6 FLG**.77 * RMC15 FLG * SF15 FLG
D         MAIN LDG GEAR DOORS + BOX
F214  1   CB7 FLG * 20.0 * WD7 FLG**.67
F214  2   CC7 FLG * 20.0 * WD7 FLG**.67
F214  6   WD7 FLG**.77 * RMC16 FLG * SF16 FLG
D         FUEL PROVISIONS
F215  1   CB8 FLG * 25.0 * WD8 FLG**.67
F215  2   CC8 FLG * 25.0 * WD8 FLG**.67
F215  6   WD8 FLG**.77 * RMC17 FLG * SF17 FLG
D         ENGINE PROVISIONS
F216  1   CB9 FLG * 25.0 * WD9 FLG**.67
F216  2   CC9 FLG * 25.0 * WD9 FLG**.67
F216  6   WD9 FLG**.77 * RMC18 FLG * SF18 FLG
D         DUCT PROVISIONS
F217  1   CB10 FLG * 20.0 * WD10 FLG**.67
F217  2   CC10 FLG * 20.0 * WD10 FLG**.67
F217  6   WD10 FLG**.77 * RMC19 FLG * SF19 FLG
D         STORES PROVISIONS
F218  1   CB11 FLG * 52.0 * WD11 FLG**.67
F218  2   CC11 FLG * 37.0 * WD11 FLG**.67
F218  6   WD11 FLG**.77 * RMC20 FLG * SF20 FLG
D         SPEED BRAKES
F219  1   CB12 FLG * 40.0 * WD12 FLG**.67
F219  2   CC12 FLG * 25.0 * WD12 FLG**.67
F219  6   WD12 FLG**.77 * RMC21 FLG * SF21 FLG
D         CABIN FLOORING + SUPPORTS
F220  1   CB13 FLG * 40.0 * WD13 FLG**.67
F220  2   CC13 FLG * 30.0 * WD13 FLG**.67
F220  6   WD13 FLG**.77 * RMC22 FLG * SF22 FLG
D         WINDOWS + WINDOW FRAMES
F221  1   CB14 FLG * 45.0 * WD14 FLG**.67
F221  2   CC14 FLG * 45.0 * WD14 FLG**.67
F221  6   WD14 FLG**.77 * RMC23 FLG * SF23 FLG
F221 10   WD1 FLG+WD2 FLG+WD3 FLG+WD4 FLG+WD5 FLG+WD6 FLG+WD7 FLG+WD8 FLG
F221 11   WD9 FLG+WD10 FLG+WD12 FLG+WD13 FLG+WD14 FLG
D         DOORS + DOOR FRAMES
F222  3   CMB FLG * 30.0 * ((221,10) + (221,11))**.67+AS2 FLG * .21
F222  6   (222,3) * .68 * FM2 FLG
```

```
D          ASSEMBLY
R223   1   6   3          15 208 1
C
D              SECONDARY STRUCTURAL SUBTOTALS
F224   1     (223,1) * RM FLG
F224   2     (223,2) * RM FLG
F224   3     (223,3) * RM FLG
D              LABOR COSTS  ($)
C
F225   1     (205,1) + (223,1)
F225   2     (205,2) + (223,2)
F225   3     (205,3) + (223,3)
F225   6     (205,6) + (223,6)
D              FUSELAGE SUBTOTAL
F226   1     (225,1) * .1
F226   2     (225,2) * .1
F226   3     (225,3) * .1
F226   6     (225,6) * .1
D              FUSELAGE REWORK
F227   1     (225,1) + (226,1)
F227   2     (225,2) + (226,2)
F227   3     (225,3) + (226,3)
F227   4     ((227,1)+(227,2)+(227,3)) * .08
F227   5     ((227,1)+(227,2)+(227,3)) * .04
F227   6     (225,6) + (226,6)
F227  10     (227,2)+(227,3)
D              FUSELAGE TOTAL
B            (9(3X,F7.0))
F228   1     (227,1) * RM FLG
F228   2     (227,2) * RM FLG
F228   3     (227,3) * RM FLG
F228   4     (227,4) * RM FLG
F228   5     (227,5) * RM FLG
D              LABOR COSTS  ($)
F229   7     (227,1)+(227,2)+(227,3)+(227,4)+(227,5)
F229   8     (228,1)+(228,2)+(228,3)+(228,4)+(228,5)
F229   9     (229,8)+(227,6)
D       TOTALS
C
P
F232   1    PN2 FLG * 1.0
D                              RDT+E COSTS
C
C
C              FUSELAGE
T
C       BASIC STRUCTURE
Z235   1 29 201   1       PN1 FLG    PN2 FLG   PC11 FLG
Z235   2 29 201   2       PN1 FLG    PN2 FLG   PC21 FLG
Z235   6 29 201   6       PN1 FLG    PN2 FLG   PC31 FLG
D          FRAMES + BULKHEADS
Z236   1 29 202   1       PN1 FLG    PN2 FLG   PC12 FLG
Z236   2 29 202   2       PN1 FLG    PN2 FLG   PC22 FLG
Z236   6 29 202   6       PN1 FLG    PN2 FLG   PC32 FLG
D          LONGERONS
Z237   1 29 203   1       PN1 FLG    PN2 FLG   PC13 FLG
Z237   2 29 203   2       PN1 FLG    PN2 FLG   PC23 FLG
Z237   6 29 203   6       PN1 FLG    PN2 FLG   PC33 FLG
D          SKINS + STRINGERS
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C
Z238  3 29 204  3      PN1 FLG   PN2 FLG  PC24 FLG
Z238  6 29 204  6      PN1 FLG   PN2 FLG  PC34 FLG
D       ASSEMBLY
R239  1  0  3        4 235 1
D         BASIC STRUCTURE SUB-TOTALS
F240  1   (239,1) * RM FLG
F240  2   (239,2) * RM FLG
F240  3   (239,3) * RM FLG
D         LABOR COSTS  ($)
C
C    SECONDARY STRUCTURE
Z241  1 29 206  1      PN1 FLG   PN2 FLG  PC15 FLG
Z241  2 29 205  2      PN1 FLG   PN2 FLG  PC25 FLG
Z241  6 29 206  6      PN1 FLG   PN2 FLG  PC35 FLG
D       COCKPIT
Z242  1 29 209  1      PN1 FLG   PN2 FLG  PC16 FLG
Z242  2 29 209  2      PN1 FLG   PN2 FLG  PC26 FLG
Z242  6 29 209  6      PN1 FLG   PN2 FLG  PC36 FLG
D       NOSE LDG GEAR DOOR + BOX
Z243  1 29 210  1      PN1 FLG   PN2 FLG  PC17 FLG
Z243  2 29 210  2      PN1 FLG   PN2 FLG  PC27 FLG
Z243  6 29 210  6      PN1 FLG   PN2 FLG  PC37 FLG
D       WING REACTION BOX
Z244  1 29 211  1      PN1 FLG   PN2 FLG  PC18 FLG
Z244  2 29 211  2      PN1 FLG   PN2 FLG  PC28 FLG
Z244  6 29 211  6      PN1 FLG   PN2 FLG  PC38 FLG
D       TAIL ATTACHMENT
Z245  1 29 212  1      PN1 FLG   PN2 FLG  PC19 FLG
Z245  2 29 212  2      PN1 FLG   PN2 FLG  PC29 FLG
Z245  6 29 212  6      PN1 FLG   PN2 FLG  PC39 FLG
D       WINDSHIELD + CANOPY
Z246  1 29 213  1      PN1 FLG   PN2 FLG PC110 FLG
Z246  2 29 213  2      PN1 FLG   PN2 FLG PC210 FLG
Z246  6 29 213  6      PN1 FLG   PN2 FLG PC310 FLG
D       MAIN LDG GEAR DOOR + BOX
Z247  1 29 214  1      PN1 FLG   PN2 FLG PC111 FLG
Z247  2 29 214  2      PN1 FLG   PN2 FLG PC211 FLG
Z247  6 29 214  6      PN1 FLG   PN2 FLG PC311 FLG
D       FUEL PROVISIONS
Z248  1 29 215  1      PN1 FLG   PN2 FLG PC112 FLG
Z248  2 29 215  2      PN1 FLG   PN2 FLG PC212 FLG
Z248  6 29 215  6      PN1 FLG   PN2 FLG PC312 FLG
D       ENGINE PROVISIONS
Z249  1 29 216  1      PN1 FLG   PN2 FLG PC113 FLG
Z249  2 29 216  2      PN1 FLG   PN2 FLG PC213 FLG
Z249  6 29 216  6      PN1 FLG   PN2 FLG PC313 FLG
D       DUCT PROVISIONS
Z250  1 29 217  1      PN1 FLG   PN2 FLG PC114 FLG
Z250  2 29 217  2      PN1 FLG   PN2 FLG PC214 FLG
Z250  6 29 217  6      PN1 FLG   PN2 FLG PC314 FLG
D       STORES PROVISIONS
Z251  1 29 218  1      PN1 FLG   PN2 FLG PC115 FLG
Z251  2 29 218  2      PN1 FLG   PN2 FLG PC215 FLG
Z251  6 29 218  6      PN1 FLG   PN2 FLG PC315 FLG
D       SPEED BRAKES
B         (5(3X,F7.0),3X,-6PF7.3,3X,F7.0,3X,F7.0)
Z252  1 29 219  1      PN1 FLG   PN2 FLG PC116 FLG
Z252  2 29 219  2      PN1 FLG   PN2 FLG PC216 FLG
Z252  6 29 219  6      PN1 FLG   PN2 FLG PC316 FLG
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D        CABIN FLOORING + SUPPORTS
B           (5(3X,F7.0),3X,-6PF7.4,3X,F7.0,3X,F7.0)
2253   1 29 220   1       PN1 FLG    PN2 FLG PC117 FLG
2253   2 29 220   2       PN1 FLG    PN2 FLG PC217 FLG
2253   6 29 220   6       PN1 FLG    PN2 FLG PC317 FLG
D        WINDOWS + WINDOW FRAMES
2254   1 29 221   1       PN1 FLG    PN2 FLG PC118 FLG
2254   2 29 221   2       PN1 FLG    PN2 FLG PC218 FLG
2254   6 29 221   6       PN1 FLG    PN2 FLG PC318 FLG
D        DOORS + DOOR FRAMES
2255   3 29 222   3       PN1 FLG    PN2 FLG PC219 FLG
2255   6 29 222   6       PN1 FLG    PN2 FLG PC319 FLG
D        ASSEMBLY
B           (5(3X,F7.0),3X,-6PF7.3,3X,F7.0,3X,F7.0)
R256   1   6   3        15 241  1
C
D             SECONDARY STRUCTURE SUB-TOTALS
F257   1     (256,1) * RM FLG
F257   2     (256,2) * RM FLG
F257   3     (256,3) * RM FLG
D             LABOR COSTS   ($)
C
F258   1     (239,1) + (256,1)
F258   2     (239,2) + (256,2)
F258   3     (239,3) + (256,3)
F258   6     (239,6) + (256,6)
D             FUSELAGE SUBTOTAL
F259   1     (258,1) * .1
F259   2     (258,2) * .1
F259   3     (258,3) * .1
F259   6     (258,6) * .1
D             FUSELAGE REWORK
F260   1     (258,1) + (259,1)
F260   2     (258,2) + (259,2)
F260   3     (258,3) + (259,3)
F260   4     ((260,1)+(260,2)+(260,3)) * .08
F260   5     ((260,1)+(260,2)+(260,3,) * .04
F260   6     (258,6) + (259,6)
D             FUSELAGE TOTAL
F261   1     (260,1) * RM FLG
F261   2     (260,2) * RM FLG
F261   3     (260,3) * RM FLG
F261   4     (260,4) * RM FLG
F261   5     (260,5) * RM FLG
D             LABOR COSTS   ($)
B            (8(3X,-6PF7.4),3X,-6PF7.2)
F262   7     (260,1)+(260,2)+(260,3)+(260,4)+(260,5)
F262   8     (261,1)+(261,2)+(261,3)+(261,4)+(261,5)
F262   9     (262,8)+(260,6)
D      TOTALS
C
P
B            (6(3X,F7.0))
C              FIRST UNIT COST
C
C
C             NACELLES
T
C
F271   1    C61 NAC * 70.0 * WD1 NAC**.67
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F271   2    CC1 NAC  *  55.  *  WD1  NAC**.67
F271   6    WD1  NAC**.77  *  RMC10  NAC  *  SF10  NAC
D         COWLING
F272   1    CB2  NAC  *  65.0  *  WD2  NAC**.67
F272   2    CC2  NAC  *  50.  *  WD2  NAC**.67
F272   6    WD2  NAC**.77  *  RMC11  NAC  *  SF11  NAC
D         PYLON
F273   1    CB3  NAC  *  45.0  *  WD3  NAC**.67
F273   2    CC3  NAC  *  50.0  *  WD3  NAC**.67
F273   6    WD3  NAC**.77  *  RMC12  NAC  *  SF12  NAC
F273  10    WD1  NAC  +  WD2  NAC  +  WD3  NAC
D         MAIN LDG GEAR DOORS + REINFORCEMENT
F274   3    CMB  NAC  *  30.  *  (273,10)**.67  +  AS2  NAC  *  .07
F274   6    (274,3)  *  .68  *  FM2  NAC
                        AMF2
D         ASSEMBLY
R275   1   0   3          4  271  1
C
D              NACELLES SUB-TOTALS
F276   1    (275,1)  *  RM  NAC
F276   2    (275,2)  *  RM  NAC
F276   3    (275,3)  *  RM  NAC
D              LABOR COSTS   ($)
C
F277   1    (275,1)  *  .1
F277   2    (275,2)  *  .1
F277   3    (275,3)  *  .1
F277   6    (275,6)  *  .1
D              NACELLES REWORK
F278   1    (275,1)  +  (277,1)
F278   2    (275,2)  +  (277,2)
F278   3    (275,3)  +  (277,3)
F278   4    ((278,1)+(278,2)+(278,3))  *  .08
F278   5    ((278,1)+(278,2)+(278,3))  *  .04
F278   6    (275,6)  +  (277,6)
F278  10    (278,2)+(278,3)
D              NACELLES TOTAL
B           (9(3X,F7.0))
F279   1    (278,1)  *  RM  NAC
F279   2    (278,2)  *  RM  NAC
F279   3    (278,3)  *  RM  NAC
F279   4    (278,4)  *  RM  NAC
F279   5    (278,5)  *  RM  NAC
D              LABOR COSTS   ($)
F280   7    (278,1)+(278,2)+(278,3)+(278,4)+(278,5)
F280   8    (279,1)+(279,2)+(279,3)+(279,4)+(279,5)
F280   9    (280,8)+(278,6)
D      TOTALS
C
P
F282   1    PN2  NAC  *  1.0
D                              RDT+E COSTS
C
C
C              NACELLES
T
C
Z285   1  29  271   1       PN1  NAC     PN2  NAC    PC15  NAC
Z285   2  29  271   2       PN1  NAC     PN2  NAC    PC25  NAC
Z285   6  29  271   6       PN1  NAC     PN2  NAC    PC35  NAC
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D        COWLING
Z286  1 29 272  1      PN1 NAC    PN2 NAC   PC16 NAC
Z286  2 29 272  2      PN1 NAC    PN2 NAC   PC26 NAC
Z286  6 29 272  6      PN1 NAC    PN2 NAC   PC36 NAC
D        PYLON
Z287  1 29 273  1      PN1 NAC    PN2 NAC   PC17 NAC
Z287  2 29 273  2      PN1 NAC    PN2 NAC   PC27 NAC
Z287  6 29 273  6      PN1 NAC    PN2 NAC   PC37 NAC
D        MAIN LDG GEAR DOORS + REINFORCEMENT
Z288  3 29 274  3      PN1 NAC    PN2 NAC   PC28 NAC
Z288  6 29 274  6      PN1 NAC    PN2 NAC   PC38 NAC
D        ASSEMBLY
R289  1  6  3        4 285 1
C
D           NACELLES SUB-TOTALS
F290  1    (289,1) * RM NAC
F290  2    (289,2) * RM NAC
F290  3    (289,3) * RM NAC
D           LABOR COSTS  ($)
C
F291  1    (289,1) * .1
F291  2    (289,2) * .1
F291  3    (289,3) * .1
F291  6    (289,6) * .1
D           NACELLES REWORK
F292  1    (289,1) + (291,1)
F292  2    (289,2) + (291,2)
F292  3    (289,3) + (291,3)
F292  4    ((292,1)+(292,2)+(292,3)) * .08
F292  5    ((292,1)+(292,2)+(292,3)) * .04
F292  6    (289,6) + (291,6)
D           NACELLES TOTAL
F293  1    (292,1) * RM NAC
F293  2    (292,2) * RM NAC
F293  3    (292,3) * RM NAC
F293  4    (292,4) * RM NAC
F293  5    (292,5) * RM NAC
D           LABOR COSTS  ($)
B          (9(3X,-6PF7.4))
F294  7    (292,1)+(292,2)+(292,3)+(292,4)+(292,5)
F294  8    (293,1)+(293,2)+(293,3)+(293,4)+(293,5)
F294  9    (294,8)+(292,6)
D     TOTALS
P
B          (6(3X,F7.0))
C            FIRST UNIT COST
C
C
C           LANDING GEAR
T
C
F301  1    CB1 LDG * 0.0 *WD1 LDG**.67
F301  2    CC1 LDG * 2.0 *WD1 LDG**.67
F301  6    WD1 LDG**.77 * RMC10 LDG * SF10 LDG
D        BRAKES
F302  1    CB2 LDG * 0.0 * WD2 LDG**.67
F302  2    CC2 LDG * 2.0 * WD2 LDG**.67
F302  6    WD2 LDG**.77 * RMC11 LDG * SF11 LDG
D        BRAKE CONTROLS
F303  1    CB3 LDG * 0.0 * WD3 LDG**.67
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F303  2    CC3 LDG * 0.5 * WD3 LDG**.67
F303  6    WD3 LDG**.77 * RMC12 LDG * SF12 LDG
D         WHEELS
F304  1    CD4 LDG * 0.0 * WD4 LDG**.67
F304  2    CC4 LDG * 0.0 * WD4 LDG**.67
F304  6    WD4 LDG**.77 * RMC13 LDG * SF13 LDG
D         TIRES
F305  1    CD5 LDG * 0.0 *WD5 LDG**.67
F305  2    CC5 LDG * 2.0 *WD5 LDG**.67
F305  6    WD5 LDG**.77 * RMC14 LDG * SF14 LDG
D         OLEOS
F306  1    CD6 LDG * 0.0 * WD6 LDG**.67
F306  2    CC6 LDG * 0.5 * WD6 LDG**.67
F306  6    WD6 LDG**.77 * RMC15 LDG * SF15 LDG
D         AXLES, TRUNNIONS + FITTINGS
F307  1    CD7 LDG * 5.0 * WD7 LDG**.67
F307  2    CC7 LDG * 7.5 * WD7 LDG**.67
F307  6    WD7 LDG**.77 * RMC16 LDG * SF16 LDG
F307 10    WD1 LDG+WD2 LDG+WD3 LDG+WD4 LDG+WD5 LDG+WD6 LDG+WD7 LDG
D         DRAG BRACES
F308  3    CMM LDG * 2.0 * (307,10)**.67
F308  6    (308,3) * .68 * FM2 LDG
                      AMF2
D         ASSEMBLY
R309  1   0   3         8 301 1
C
D             LANDING GEAR SUB-TOTALS
F310  1    (309,1) * RM LDG
F310  2    (309,2) * RM LDG
F310  3    (309,3) * RM LDG
D             LABOR COSTS   ($)
C
F311  1    (309,1) * .1
F311  2    (309,2) * .1
F311  3    (309,3) * .1
F311  6    (309,6) * .1
D             LANDING GEAR REWORK
F312  1    (309,1) + (311,1)
F312  2    (309,2) + (311,2)
F312  3    (309,3) + (311,3)
F312  4    ((312,1)+(312,2)+(312,3)) * .08
F312  5    ((312,1)+(312,2)+(312,3)) * .04
F312  6    (309,6) + (311,6)
F312 10    (312,2)+(312,3)
D             LANDING GEAR TOTAL
B          (9(3X,F7.0))
F313  1    (312,1) * RM LDG
F313  2    (312,2) * RM LDG
F313  3    (312,3) * RM LDG
F313  4    (312,4) * RM LDG
F313  5    (312,5) * RM LDG
D             LABOR COSTS   ($)
F314  7    (312,1)+(312,2)+(312,3)+(312,4)+(312,5)
F314  8    (313,1)+(313,2)+(313,3)+(313,4)+(313,5)
F314  9    (314,8)+(312,6)
D      TOTALS
C
C
F315  1    (59,1)+(124,1)+(171,1)+(227,1)+(278,1)+(312,1)
F315  2    (59,2)+(124,2)+(171,2)+(227,2)+(278,2)+(312,2)
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F315  3    (59,3)+(124,3)+(171,3)+(227,3)+(278,3)+(312,3)
F315  4    (59,4)+(124,4)+(171,4)+(227,4)+(278,4)+(312,4)
F315  5    (59,5)+(124,5)+(171,5)+(227,5)+(278,5)+(312,5)
F315  6    (59,6)+(124,6)+(171,6)+(227,6)+(278,6)+(312,6)
F315  7    (315,1)+(315,2)+(315,3)+(315,4)+(315,5)
D           AIRFRAME STRUCTURE TOTAL
F316  1    (60,1)+(125,1)+(172,1)+(228,1)+(279,1)+(313,1)
F316  2    (60,2)+(125,2)+(172,2)+(228,2)+(279,2)+(313,2)
F316  3    (60,3)+(125,3)+(172,3)+(228,3)+(279,3)+(313,3)
F316  4    (60,4)+(125,4)+(172,4)+(228,4)+(279,4)+(313,4)
F316  5    (60,5)+(125,5)+(172,5)+(228,5)+(279,5)+(313,5)
F316  8    (316,1)+(316,2)+(316,3)+(316,4)+(316,5)
F316  9    (315,7) + (316,8)
D           AIRFRAME LABOR RATE TOTAL
P
F317  1    PN2 LDG * 1.0
D                             RDT+E COSTS
C
C
C           LANDING GEAR
T
C
Z318  1 29 301  1      PN1 LDG   PN2 LDG  PC15 LDG
Z318  2 29 301  2      PN1 LDG   PN2 LDG  PC25 LDG
Z318  6 29 301  6      PN1 LDG   PN2 LDG  PC35 LDG
D       BRAKES
Z319  1 29 302  1      PN1 LDG   PN2 LDG  PC16 LDG
Z319  2 29 302  2      PN1 LDG   PN2 LDG  PC26 LDG
Z319  6 29 302  6      PN1 LDG   PN2 LDG  PC36 LDG
D       BRAKE CONTROLS
Z320  1 29 303  1      PN1 LDG   PN2 LDG  PC17 LDG
Z320  2 29 303  2      PN1 LDG   PN2 LDG  PC27 LDG
Z320  6 29 303  6      PN1 LDG   PN2 LDG  PC37 LDG
D       WHEELS
Z321  1 29 304  1      PN1 LDG   PN2 LDG  PC18 LDG
Z321  2 29 304  2      PN1 LDG   PN2 LDG  PC28 LDG
Z321  6 29 304  6      PN1 LDG   PN2 LDG  PC38 LDG
D       TIRES
Z322  1 29 305  1      PN1 LDG   PN2 LDG  PC19 LDG
Z322  2 29 305  2      PN1 LDG   PN2 LDG  PC29 LDG
Z322  6 29 305  6      PN1 LDG   PN2 LDG  PC39 LDG
D       OLEOS
Z323  1 29 306  1      PN1 LDG   PN2 LDG PC110 LDG
Z323  2 29 306  2      PN1 LDG   PN2 LDG PC210 LDG
Z323  6 29 306  6      PN1 LDG   PN2 LDG PC310 LDG
D       AXLES, TRUNNIONS + FITTINGS
Z324  1 29 307  1      PN1 LDG   PN2 LDG PC111 LDG
Z324  2 29 307  2      PN1 LDG   PN2 LDG PC211 LDG
Z324  6 29 307  6      PN1 LDG   PN2 LDG PC311 LDG
D       DRAG BRACES
Z325  3 29 308  3      PN1 LDG   PN2 LDG PC212 LDG
Z325  6 29 308  6      PN1 LDG   PN2 LDG PC312 LDG
D       ASSEMBLY
R326  1  6  3        8 318 1
C
D           LANDING GEAR SUB-TOTALS
F327  1    (326,1) * RM LDG
F327  2    (326,2) * RM LDG
F327  3    (326,3) * RM LDG
D           LABOR COSTS  ($)
```

```
C
F328  1    (326,1) * .1
F328  2    (326,2) * .1
F328  3    (326,3) * .1
F328  6    (326,6) * .1
D           LANDING GEAR REWORK
F329  1    (326,1) + (328,1)
F329  2    (326,2) + (328,2)
F329  3    (326,3) + (328,3)
F329  4    ((329,1)+(329,2)+(329,3)) * .08
F329  5    ((329,1)+(329,2)+(329,3)) * .04
F329  6    (326,6) + (328,6)
D           LANDING GEAR TOTAL
F330  1    (329,1) * RM LDG
F330  2    (329,2) * RM LDG
F330  3    (329,3) * RM LDG
F330  4    (329,4) * RM LDG
F330  5    (329,5) * RM LDG
D           LABOR COSTS  ($)
F331  7    (329,1)+(329,2)+(329,3)+(329,4)+(329,5)
F331  8    (330,1)+(330,2)+(330,3)+(330,4)+(330,5)
F331  9    (331,8)+(329,6)
D     TOTALS
C
C
B          (5(3X,-6PF7.4),3X,-6PF7.3)
F332  1    (92,1)+(149,1)+(194,1)+(260,1)+(292,1)+(329,1)
F332  2    (92,2)+(149,2)+(194,2)+(260,2)+(292,2)+(329,2)
F332  3    (92,3)+(149,3)+(194,3)+(260,3)+(292,3)+(329,3)
F332  4    (92,4)+(149,4)+(194,4)+(260,4)+(292,4)+(329,4)
F332  5    (92,5)+(149,5)+(194,5)+(260,5)+(292,5)+(329,5)
F332  6    (92,6)+(149,6)+(194,6)+(260,6)+(292,6)+(329,6)
F332  7    (332,1)+(332,2)+(332,3)+(332,4)+(332,5)
D           AIRFRAME STRUCTURE TOTAL
F333  1    (93,1)+(150,1)+(195,1)+(261,1)+(293,1)+(330,1)
F333  2    (93,2)+(150,2)+(195,2)+(261,2)+(293,2)+(330,2)
F333  3    (93,3)+(150,3)+(195,3)+(261,3)+(293,3)+(330,3)
F333  4    (93,4)+(150,4)+(195,4)+(261,4)+(293,4)+(330,4)
F333  5    (93,5)+(150,5)+(195,5)+(261,5)+(293,5)+(330,5)
F333  8    (333,1)+(333,2)+(333,3)+(333,4)+(333,5)
F333  9    (332,7) + (333,8)
D           AIRFRAME LABOR TOTAL  ($)
P
B          (6(3X,F7.0))
F334  1    PN3 WNG * 1.0
D            RECURRING PRODUCTION COSTS
C
C
C           WING
T
C     STRUCTURAL BOX
B          (9(3X,-6PF7.4))
Z335  1 29  31  1      PN2 WNG    PN4 WNG   PC11 WNG
Z335  2 29  31  2      PN2 WNG    PN4 WNG   PC21 WNG
Z335  6 29  31  6      PN2 WNG    PN4 WNG   PC31 WNG
D        RIBS
Z336  1 29  32  1      PN2 WNG    PN4 WNG   PC12 WNG
Z336  2 29  32  2      PN2 WNG    PN4 WNG   PC22 WNG
Z336  6 29  32  6      PN2 WNG    PN4 WNG   PC32 WNG
D        SPARS
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Z337  1 29   33   1       PN2 WNG    PN4 WNG   PC13 WNG
Z337  2 29   33   2       PN2 WNG    PN4 WNG   PC23 WNG
Z337  6 29   33   6       PN2 WNG    PN4 WNG   PC33 WNG
D        COVERS
C
Z338  3 29   34   3       PN2 WNG    PN4 WNG   PC24 WNG
Z338  6 29   34   6       PN2 WNG    PN4 WNG   PC34 WNG
D        ASSEMBLY
R339  1  0   3          4 335 1
D              STRUCTURAL BOX SUB-TOTALS
F340  1     (339,1) * RM WNG
F340  2     (339,2) * RM WNG
F340  3     (339,3) * RM WNG
D              LABOR COSTS  ($)
C
C     SECONDARY STRUCTURE
Z341  1 29   38   1       PN2 WNG    PN4 WNG   PC15 WNG
Z341  2 29   38   2       PN2 WNG    PN4 WNG   PC25 WNG
Z341  6 29   38   6       PN2 WNG    PN4 WNG   PC35 WNG
D        LEADING EDGE
Z342  1 29   39   1       PN2 WNG    PN4 WNG   PC16 WNG
Z342  2 29   39   2       PN2 WNG    PN4 WNG   PC26 WNG
Z342  6 29   39   6       PN2 WNG    PN4 WNG   PC36 WNG
D        TRAILING EDGE
Z343  1 29   40   1       PN2 WNG    PN4 WNG   PC17 WNG
Z343  2 29   40   2       PN2 WNG    PN4 WNG   PC27 WNG
Z343  6 29   40   6       PN2 WNG    PN4 WNG   PC37 WNG
D        AILERONS
Z344  1 29   41   1       PN2 WNG    PN4 WNG   PC18 WNG
Z344  2 29   41   2       PN2 WNG    PN4 WNG   PC28 WNG
Z344  6 29   41   6       PN2 WNG    PN4 WNG   PC38 WNG
D        FAIRINGS
Z345  1 29   42   1       PN2 WNG    PN4 WNG   PC19 WNG
Z345  2 29   42   2       PN2 WNG    PN4 WNG   PC29 WNG
Z345  6 29   42   6       PN2 WNG    PN4 WNG   PC39 WNG
D        TIPS
Z346  1 29   43   1       PN2 WNG    PN4 WNG PC110 WNG
Z346  2 29   43   2       PN2 WNG    PN4 WNG PC210 WNG
Z346  6 29   43   6       PN2 WNG    PN4 WNG PC310 WNG
D        SPOILERS
Z347  1 29   44   1       PN2 WNG    PN4 WNG PC111 WNG
Z347  2 29   44   2       PN2 WNG    PN4 WNG PC211 WNG
Z347  6 29   44   6       PN2 WNG    PN4 WNG PC311 WNG
D        FLAPS + FLAPERONS
Z348  1 29   45   1       PN2 WNG    PN4 WNG PC112 WNG
Z348  2 29   45   2       PN2 WNG    PN4 WNG PC212 WNG
Z348  6 29   45   6       PN2 WNG    PN4 WNG PC312 WNG
D        ATTACHMENT STRUCTURE
Z349  1 29   46   1       PN2 WNG    PN4 WNG PC113 WNG
Z349  2 29   46   2       PN2 WNG    PN4 WNG PC213 WNG
Z349  6 29   46   6       PN2 WNG    PN4 WNG PC313 WNG
D        ACCESS + OTHER DOORS
Z350  1 29   47   1       PN2 WNG    PN4 WNG PC114 WNG
Z350  2 29   47   2       PN2 WNG    PN4 WNG PC214 WNG
Z350  6 29   47   6       PN2 WNG    PN4 WNG PC314 WNG
D        AIR INDUCTION
Z351  1 29   48   1       PN2 WNG    PN4 WNG PC115 WNG
Z351  2 29   48   2       PN2 WNG    PN4 WNG PC215 WNG
Z351  6 29   48   6       PN2 WNG    PN4 WNG PC315 WNG
D        HIGH LIFT DUCTING
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Z352  1 29  49  1        PN2 WNG    PN4 WNG PC116 WNG
Z352  2 29  49  2        PN2 WNG    PN4 WNG PC216 WNG
Z352  6 29  49  6        PN2 WNG    PN4 WNG PC316 WNG
D        SLATS
Z353  1 29  50  1        PN2 WNG    PN4 WNG PC117 WNG
Z353  2 29  50  2        PN2 WNG    PN4 WNG PC217 WNG
Z353  6 29  50  6        PN2 WNG    PN4 WNG PC317 WNG
D        HINGES, BRACKETS, SEALS
Z354  1 29  51  1        PN2 WNG    PN4 WNG PC118 WNG
Z354  2 29  51  2        PN2 WNG    PN4 WNG PC218 WNG
Z354  6 29  51  6        PN2 WNG    PN4 WNG PC318 WNG
D        PIVOTS + FOLDS
Z355  1 29  52  1        PN2 WNG    PN4 WNG PC119 WNG
Z355  2 29  52  2        PN2 WNG    PN4 WNG PC219 WNG
Z355  6 29  52  6        PN2 WNG    PN4 WNG PC319 WNG
D        CENTER SECTION
Z356  1 29  53  1        PN2 WNG    PN4 WNG PC120 WNG
Z356  2 29  53  2        PN2 WNG    PN4 WNG PC220 WNG
Z356  6 29  53  6        PN2 WNG    PN4 WNG PC320 WNG
D        OTHER
Z357  3 29  54  3        PN2 WNG    PN4 WNG PC221 WNG
Z357  6 29  54  6        PN2 WNG    PN4 WNG PC321 WNG
D        ASSEMBLY
R358  1  0  3       17 341 1
C
D           SECONDARY STRUCTURE SUB-TOTAL
F359  1    (358,1) * RM WNG
F359  2    (358,2) * RM WNG
F359  3    (358,3) * RM WNG
D           LABOR COSTS  ($)
C
F360  1    (339,1) + (358,1)
F360  2    (339,2) + (358,2)
F360  3    (339,3) + (358,3)
F360  6    (339,6) + (358,6)
D           WING SUBTOTAL
F361  1    (360,1) * .1
F361  2    (360,2) * .1
F361  3    (360,3) * .1
F361  6    (360,6) * .1
D           WING REWORK
F362  1    (360,1) + (361,1)
F362  2    (360,2) + (361,2)
F362  3    (360,3) + (361,3)
F362  4    ((362,1)+(362,2)+(362,3)) * .08
F362  5    ((362,1)+(362,2)+(362,3)) * .04
F362  6    (360,6) + (361,6)
D           WING TOTAL
F363  1    (362,1) * RM WNG
F363  2    (362,2) * RM WNG
F363  3    (362,3) * RM WNG
F363  4    (362,4) * RM WNG
F363  5    (362,5) * RM WNG
D           LABOR COSTS  ($)
F364  7    (362,1)+(362,2)+(362,3)+(362,4)+(362,5)
F364  8    (363,1)+(363,2)+(363,3)+(363,4)+(363,5)
F364  9    (364,6)+(362,6)
D     TOTALS
C
P
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B           (6(3X,F7.0))
F365   1    PN3 HTL * 1.0
D             RECURRING PRODUCTION COSTS
C
C
C            HORIZONTAL
T
C     STRUCTURAL BOX
B           (9(3X,-6PF7.4))
Z366   1 29 100   1      PN2 HTL    PN4 HTL   PC11 HTL
Z366   2 29 100   2      PN2 HTL    PN4 HTL   PC21 HTL
Z366   6 29 100   6      PN2 HTL    PN4 HTL   PC31 HTL
D         RIBS
Z367   1 29 101   1      PN2 HTL    PN4 HTL   PC12 HTL
Z367   2 29 101   2      PN2 HTL    PN4 HTL   PC22 HTL
Z367   6 29 101   6      PN2 HTL    PN4 HTL   PC32 HTL
D         SPARS
Z368   1 29 102   1      PN2 HTL    PN4 HTL   PC13 HTL
Z368   2 29 102   2      PN2 HTL    PN4 HTL   PC23 HTL
Z368   6 29 102   6      PN2 HTL    PN4 HTL   PC33 HTL
D         COVERS
C
Z369   3 29 103   3      PN2 HTL    PN4 HTL   PC24 HTL
Z369   6 29 103   6      PN2 HTL    PN4 HTL   PC34 HTL
D         ASSEMBLY
R370   1  6  3        4 366 1
D            STRUCTURAL BOX SUB-TOTALS
F371   1    (370,1) * RM HTL
F371   2    (370,2) * RM HTL
F371   3    (370,3) * RM HTL
D            LABOR COSTS  ($)
C
C     SECONDARY STRUCTURE
Z372   1 29 106   1      PN2 HTL    PN4 HTL   PC15 HTL
Z372   2 29 106   2      PN2 HTL    PN4 HTL   PC25 HTL
Z372   6 29 106   6      PN2 HTL    PN4 HTL   PC35 HTL
D         LEADING EDGE
Z373   1 29 107   1      PN2 HTL    PN4 HTL   PC16 HTL
Z373   2 29 107   2      PN2 HTL    PN4 HTL   PC26 HTL
Z373   6 29 107   6      PN2 HTL    PN4 HTL   PC36 HTL
D         TRAILING EDGE
Z374   1 29 108   1      PN2 HTL    PN4 HTL   PC17 HTL
Z374   2 29 108   2      PN2 HTL    PN4 HTL   PC27 HTL
Z374   6 29 108   6      PN2 HTL    PN4 HTL   PC37 HTL
D         FAIRINGS
Z375   1 29 109   1      PN2 HTL    PN4 HTL   PC18 HTL
Z375   2 29 109   2      PN2 HTL    PN4 HTL   PC28 HTL
Z375   6 29 109   6      PN2 HTL    PN4 HTL   PC38 HTL
D         TIPS
Z376   1 29 110   1      PN2 HTL    PN4 HTL   PC19 HTL
Z376   2 29 110   2      PN2 HTL    PN4 HTL   PC29 HTL
Z376   6 29 110   6      PN2 HTL    PN4 HTL   PC39 HTL
D         ATTACHMENT STRUCTURE
Z377   1 29 111   1      PN2 HTL    PN4 HTL PC110 HTL
Z377   2 29 111   2      PN2 HTL    PN4 HTL PC210 HTL
Z377   6 29 111   6      PN2 HTL    PN4 HTL PC310 HTL
D         ACCESS + OTHER DOORS
Z378   1 29 112   1      PN2 HTL    PN4 HTL PC111 HTL
Z378   2 29 112   2      PN2 HTL    PN4 HTL PC211 HTL
Z378   6 29 112   6      PN2 HTL    PN4 HTL PC311 HTL
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D         HINGES, BRACKETS, SEALS
2379   1  29 113  1        PN2 HTL    PN4 HTL PC112 HTL
2379   2  29 113  2        PN2 HTL    PN4 HTL PC212 HTL
2379   6  29 113  6        PN2 HTL    PN4 HTL PC312 HTL
D         PIVOTS + FOLDS
2380   1  29 114  1        PN2 HTL    PN4 HTL PC113 HTL
2380   2  29 114  2        PN2 HTL    PN4 HTL PC213 HTL
2380   6  29 114  6        PN2 HTL    PN4 HTL PC313 HTL
D         CENTER SECTION
2381   1  29 115  1        PN2 HTL    PN4 HTL PC114 HTL
2381   2  29 115  2        PN2 HTL    PN4 HTL PC214 HTL
2381   6  29 115  6        PN2 HTL    PN4 HTL PC314 HTL
D         ELEVATORS
2382   1  29 116  1        PN2 HTL    PN4 HTL PC115 HTL
2382   2  29 116  2        PN2 HTL    PN4 HTL PC215 HTL
2382   6  29 116  6        PN2 HTL    PN4 HTL PC315 HTL
D         BALANCE WEIGHTS
2383   3  29 117  3        PN2 HTL    PN4 HTL PC216 HTL
2383   6  29 117  6        PN2 HTL    PN4 HTL PC316 HTL
D         ASSEMBLY
R384   1   6   3         12  371  1
C
D            SECONDARY STRUCTURE SUB-TOTAL
F385   1    (384,1) * RM HTL
F385   2    (384,2) * RM HTL
F385   3    (384,3) * RM HTL
D            LABOR COSTS   ($)
C
F386   1    (366,1) + (384,1)
F386   2    (366,2) + (384,2)
F386   3    (366,3) + (384,3)
F386   6    (366,6) + (384,6)
C            HORIZONTAL SUBTOTAL
F387   1    (386,1) * .1
F387   2    (386,2) * .1
F387   3    (386,3) * .1
F387   6    (386,6) * .1
D            HORIZONTAL REWORK
F388   1    (386,1) + (387,1)
F388   2    (386,2) + (387,2)
F388   3    (386,3) + (387,3)
F388   4    ((388,1)+(388,2)+(388,3)) * .08
F388   5    ((388,1)+(388,2)+(388,3)) * .04
F388   6    (386,6) + (387,6)
D            HORIZONTAL TOTAL
F389   1    (388,1) * RM HTL
F389   2    (388,2) * RM HTL
F389   3    (388,3) * RM HTL
F389   4    (388,4) * RM HTL
F389   5    (388,5) * RM HTL
D            LABOR COSTS   ($)
F390   7    (388,1)+(388,2)+(388,3)+(388,4)+(388,5)
F390   8    (389,1)+(389,2)+(389,3)+(389,4)+(389,5)
F390   9    (390,8)+(388,6)
D      TOTALS
C
P
B           (6(3X,F7.0))
F391   1    PN3 VTL * 1.0
D             RECURRING PRODUCTION COSTS
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C
C
C          VERTICAL
T
N          (9(3X,-0PF7.4))
C     STRUCTURAL BOX
Z592   1 29 151   1       PN2 VTL    PN4 VTL    PC11 VTL
Z592   2 29 151   2       PN2 VTL    PN4 VTL    PC21 VTL
Z592   6 29 151   6       PN2 VTL    PN4 VTL    PC31 VTL
D          RIBS
Z593   1 29 152   1       PN2 VTL    PN4 VTL    PC12 VTL
Z593   2 29 152   2       PN2 VTL    PN4 VTL    PC22 VTL
Z593   6 29 152   6       PN2 VTL    PN4 VTL    PC32 VTL
D          SPARS
Z594   1 29 153   1       PN2 VTL    PN4 VTL    PC13 VTL
Z594   2 29 153   2       PN2 VTL    PN4 VTL    PC23 VTL
Z594   6 29 153   6       PN2 VTL    PN4 VTL    PC33 VTL
D          COVERS
C
Z595   3 29 154   3       PN2 VTL    PN4 VTL    PC24 VTL
Z595   6 29 154   6       PN2 VTL    PN4 VTL    PC34 VTL
D          ASSEMBLY
R596   1  0  3        4 592 1
D              STRUCTURAL BOX SUB-TOTALS
F597   1     (596,1) * RN VTL
F597   2     (596,2) * RN VTL
F597   3     (596,3) * RN VTL
D              LABOR COSTS  ($)
C
C     SECONDARY STRUCTURE
Z598   1 29 158   1       PN2 VTL    PN4 VTL    PC15 VTL
Z598   2 29 158   2       PN2 VTL    PN4 VTL    PC25 VTL
Z598   6 29 158   6       PN2 VTL    PN4 VTL    PC35 VTL
D          LEADING EDGE
Z599   1 29 159   1       PN2 VTL    PN4 VTL    PC16 VTL
Z599   2 29 159   2       PN2 VTL    PN4 VTL    PC26 VTL
Z599   6 29 159   6       PN1 VTL    PN2 VTL    PC36 VTL
D          TRAILING EDGE
Z600   1 29 160   1       PN2 VTL    PN4 VTL    PC17 VTL
Z600   2 29 160   2       PN2 VTL    PN4 VTL    PC27 VTL
Z600   6 29 160   6       PN2 VTL    PN4 VTL    PC37 VTL
D          FAIRING
Z601   1 29 161   1       PN2 VTL    PN4 VTL    PC18 VTL
Z601   2 29 161   2       PN2 VTL    PN4 VTL    PC28 VTL
Z601   6 29 161   6       PN2 VTL    PN4 VTL    PC38 VTL
D          TIPS
Z602   1 29 162   1       PN2 VTL    PN4 VTL    PC19 VTL
Z602   2 29 162   2       PN2 VTL    PN4 VTL    PC29 VTL
Z602   6 29 162   6       PN2 VTL    PN4 VTL    PC39 VTL
D          ATTACHMENT STRUCTURE
Z603   1 29 163   1       PN2 VTL    PN4 VTL PC110 VTL
Z603   2 29 163   2       PN2 VTL    PN4 VTL PC210 VTL
Z603   6 29 163   6       PN2 VTL    PN4 VTL PC310 VTL
D          ACCESS + OTHER DOOR
Z604   1 29 164   1       PN2 VTL    PN4 VTL PC111 VTL
Z604   2 29 164   2       PN2 VTL    PN4 VTL PC211 VTL
Z604   6 29 164   6       PN2 VTL    PN4 VTL PC311 VTL
D          HINGES, BRACKETS, SEALS
Z605   1 29 165   1       PN2 VTL    PN4 VTL PC112 VTL
Z605   2 29 165   2       PN2 VTL    PN4 VTL PC212 VTL
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Z405  6 29 165  6      PN2 VTL   PN4 VTL PC312 VTL
D        RUDDER
Z406  3 29 166  3      PN2 VTL   PN4 VTL PC213 VTL
Z406  6 29 166  6      PN2 VTL   PN4 VTL PC313 VTL
D        ASSEMBLY
R407  1   6   3        9 398  1
C
D           SECONDARY STRUCTURE SUB-TOTAL
F408  1    (407,1) * RM VTL
F408  2    (407,2) * RM VTL
F408  3    (407,3) * RM VTL
D           LABOR COSTS   ($)
C
F409  1    (395,1) + (407,1)
F409  2    (395,2) + (407,2)
F409  3    (395,3) + (407,3)
F409  6    (395,6) + (407,6)
D           VERTICAL SUBTOTAL
F410  1    (409,1) * .1
F410  2    (409,2) * .1
F410  3    (409,3) * .1
F410  6    (409,6) * .1
D           VERTICAL REWORK
F411  1    (409,1) + (410,1)
F411  2    (409,2) + (410,2)
F411  3    (409,3) + (410,3)
F411  4    ((411,1)+(411,2)+(411,3)) * .08
F411  5    ((411,1)+(411,2)+(411,3)) * .04
F411  6    (409,6) + (410,6)
D           VERTICAL TOTAL
F412  1    (411,1) * RM VTL
F412  2    (411,2) * RM VTL
F412  3    (411,3) * RM VTL
F412  4    (411,4) * RM VTL
F412  5    (411,5) * RM VTL
D           LABOR COSTS   ($)
F413  7    (411,1)+(411,2)+(411,3)+(411,4)+(411,5)
F413  8    (412,1)+(412,2)+(412,3)+(412,4)+(412,5)
F413  9    (413,8)+(411,6)
D     TOTALS
C
P
B           (6(3X,F7.0))
F415  1    PN3 FLG * 1.0
D             RECURRING PRODUCTION COSTS
C
C
C           FUSELAGE
T
C     BASIC STRUCTURE
B           (5(3X,-6PF7.3),3X,-6PF7.2,2(3X,-6PF7.3),3X,-6PF7.2)
Z416  1 29 201  1      PN2 FLG   PN4 FLG  PC11 FLG
Z416  2 29 201  2      PN2 FLG   PN4 FLG  PC21 FLG
Z416  6 29 201  6      PN2 FLG   PN4 FLG  PC31 FLG
D        FRAMES + BULKHEADS
Z417  1 29 202  1      PN2 FLG   PN4 FLG  PC12 FLG
Z417  2 29 202  2      PN2 FLG   PN4 FLG  PC22 FLG
Z417  6 29 202  6      PN2 FLG   PN4 FLG  PC32 FLG
D        LONGERONS
Z418  1 29 203  1      PN2 FLG   PN4 FLG  PC13 FLG
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Z418  2 29 203  2      PN2 FLG   PN4 FLG  PC23 FLG
Z418  6 29 203  6      PN2 FLG   PN4 FLG  PC33 FLG
D       SKINS + STRINGERS
C
Z419  3 29 204  3      PN2 FLG   PN4 FLG  PC24 FLG
Z419  6 29 204  6      PN2 FLG   PN4 FLG  PC34 FLG
D       ASSEMBLY
R420  1  0  3        4 416 1
D         BASIC STRUCTURE SUB-TOTALS
F421  1    (420,1) * RM FLG
F421  2    (420,2) * RM FLG
F421  3    (420,3) * RM FLG
D          LABOR COSTS  ($)
C
C    SECONDARY STRUCTURE
Z422  1 29 208  1      PN2 FLG   PN4 FLG  PC15 FLG
Z422  2 29 208  2      PN2 FLG   PN4 FLG  PC25 FLG
Z422  6 29 208  6      PN2 FLG   PN4 FLG  PC35 FLG
D       COCKPIT
Z423  1 29 209  1      PN2 FLG   PN4 FLG  PC16 FLG
Z423  2 29 209  2      PN2 FLG   PN4 FLG  PC26 FLG
Z423  6 29 209  6      PN2 FLG   PN4 FLG  PC36 FLG
D       NOSE LDG GEAR DOOR + BOX
Z424  1 29 210  1      PN2 FLG   PN4 FLG  PC17 FLG
Z424  2 29 210  2      PN2 FLG   PN4 FLG  PC27 FLG
Z424  6 29 210  6      PN2 FLG   PN4 FLG  PC37 FLG
D       WING REACTION BOX
Z425  1 29 211  1      PN2 FLG   PN4 FLG  PC18 FLG
Z425  2 29 211  2      PN2 FLG   PN4 FLG  PC28 FLG
Z425  6 29 211  6      PN2 FLG   PN4 FLG  PC38 FLG
D       TAIL ATTACHMENT
Z426  1 29 212  1      PN2 FLG   PN4 FLG  PC19 FLG
Z426  2 29 212  2      PN2 FLG   PN4 FLG  PC29 FLG
Z426  6 29 212  6      PN2 FLG   PN4 FLG  PC39 FLG
D       WINDSHIELD + CANOPY
Z427  1 29 213  1      PN2 FLG   PN4 FLG PC110 FLG
Z427  2 29 213  2      PN2 FLG   PN4 FLG PC210 FLG
Z427  6 29 213  6      PN2 FLG   PN4 FLG PC310 FLG
D       MAIN LDG GEAR DOOR + BOX
Z428  1 29 214  1      PN2 FLG   PN4 FLG PC111 FLG
Z428  2 29 214  2      PN2 FLG   PN4 FLG PC211 FLG
Z428  6 29 214  6      PN2 FLG   PN4 FLG PC311 FLG
D       FUEL PROVISIONS
Z429  1 29 215  1      PN2 FLG   PN4 FLG PC112 FLG
Z429  2 29 215  2      PN2 FLG   PN4 FLG PC212 FLG
Z429  6 29 215  6      PN2 FLG   PN4 FLG PC312 FLG
D       ENGINE PROVISIONS
Z430  1 29 216  1      PN2 FLG   PN4 FLG PC113 FLG
Z430  2 29 216  2      PN2 FLG   PN4 FLG PC213 FLG
Z430  6 29 216  6      PN2 FLG   PN4 FLG PC313 FLG
D       DUCT PROVISIONS
Z431  1 29 217  1      PN2 FLG   PN4 FLG PC114 FLG
Z431  2 29 217  2      PN2 FLG   PN4 FLG PC214 FLG
Z431  6 29 217  6      PN2 FLG   PN4 FLG PC314 FLG
D       STORES PROVISIONS
Z432  1 29 218  1      PN2 FLG   PN4 FLG PC115 FLG
Z432  2 29 218  2      PN2 FLG   PN4 FLG PC215 FLG
Z432  6 29 218  6      PN2 FLG   PN4 FLG PC315 FLG
D       SPEED BRAKES
B          (5(3X,-6PF7.3),3X,-6PF7.1,2(3X,-6PF7.3),3X,-6PF7.1)
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Z433  1 29 219  1       PN2 FLG   PN4 FLG PC116 FLG
Z433  2 29 219  2       PN2 FLG   PN4 FLG PC216 FLG
Z433  6 29 219  6       PN2 FLG   PN4 FLG PC316 FLG
D       CABIN FLOORING + SUPPORTS
B         (5(3X,-6PF7.3),3X,-6PF7.2,2(3X,-6PF7.3),3X,-6PF7.2)
Z434  1 29 220  1       PN2 FLG   PN4 FLG PC117 FLG
Z434  2 29 220  2       PN2 FLG   PN4 FLG PC217 FLG
Z434  6 29 220  6       PN2 FLG   PN4 FLG PC317 FLG
D       WINDOWS + WINDOW FRAMES
Z435  1 29 221  1       PN2 FLG   PN4 FLG PC118 FLG
Z435  2 29 221  2       PN2 FLG   PN4 FLG PC218 FLG
Z435  6 29 221  6       PN2 FLG   PN4 FLG PC318 FLG
D       DOORS + DOOR FRAMES
Z436  3 29 222  3       PN2 FLG   PN4 FLG PC219 FLG
Z436  6 29 222  6       PN2 FLG   PN4 FLG PC319 FLG
D       ASSEMBLY
B         (5(3X,-6PF7.3),3X,-6PF7.1,2(3X,-6PF7.3),3X,-6PF7.1)
R437  1  6  3        15 422 1
C
D           SECONDARY STRUCTURE SUB-TOTALS
F438  1    (437,1) * RM FLG
F438  2    (437,2) * RM FLG
F438  3    (437,3) * RM FLG
D           LABOR COSTS  ($)
C
F439  1    (420,1) + (437,1)
F439  2    (420,2) + (437,2)
F439  3    (420,3) + (437,3)
F439  6    (420,6) + (437,6)
D           FUSELAGE SUBTOTAL
F440  1    (439,1) * .1
F440  2    (439,2) * .1
F440  3    (439,3) * .1
F440  6    (439,6) * .1
D           FUSELAGE REWORK
F441  1    (439,1) + (440,1)
F441  2    (439,2) + (440,2)
F441  3    (439,3) + (440,3)
F441  4    ((441,1)+(441,2)+(441,3)) * .08
F441  5    ((441,1)+(441,2)+(441,3)) * .04
F441  6    (439,6) + (440,6)
D           FUSELAGE TOTAL
F442  1    (441,1) * RM FLG
F442  2    (441,2) * RM FLG
F442  3    (441,3) * RM FLG
F442  4    (441,4) * RM FLG
F442  5    (441,5) * RM FLG
D           LABOR COSTS  ($)
F443  7    (441,1)+(441,2)+(441,3)+(441,4)+(441,5)
F443  8    (442,1)+(442,2)+(442,3)+(442,4)+(442,5)
F443  9    (443,8)+(441,6)
D     TOTALS
C
P
B          (6(3X,F7.0))
F445  1    PN3 NAC * 1.0
D            RECURRING PRODUCTION COSTS
C
C
C           NACELLES
```

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T
B           (9(3X,-6PF7.4))
C
Z446   1 29 271   1       PN2 NAC    PN4 NAC   PC15 NAC
Z446   2 29 271   2       PN2 NAC    PN4 NAC   PC25 NAC
Z446   6 29 271   6       PN2 NAC    PN4 NAC   PC35 NAC
D          COWLING
Z447   1 29 272   1       PN2 NAC    PN4 NAC   PC16 NAC
Z447   2 29 272   2       PN2 NAC    PN4 NAC   PC26 NAC
Z447   6 29 272   6       PN2 NAC    PN4 NAC   PC36 NAC
D          PYLON
Z448   1 29 273   1       PN2 NAC    PN4 NAC   PC17 NAC
Z448   2 29 273   2       PN2 NAC    PN4 NAC   PC27 NAC
Z448   6 29 273   6       PN2 NAC    PN4 NAC   PC37 NAC
D          MAIN LDG GEAR DOORS + REINFORCEMENT
Z449   3 29 274   3       PN2 NAC    PN4 NAC   PC28 NAC
Z449   6 29 274   6       PN2 NAC    PN4 NAC   PC38 NAC
D          ASSEMBLY
R450   1  6  3         4 446 1
C
D            NACELLES SUB-TOTALS
F451   1    (450,1) * RM NAC
F451   2    (450,2) * RM NAC
F451   3    (450,3) * RM NAC
D            LABOR COSTS   ($)
C
F452   1    (450,1) * .1
F452   2    (450,2) * .1
F452   3    (450,3) * .1
F452   6    (450,6) * .1
D            NACELLES REWORK
F453   1    (450,1) + (452,1)
F453   2    (450,2) + (452,2)
F453   3    (450,3) + (452,3)
F453   4    ((453,1)+(453,2)+(453,3)) * .08
F453   5    ((453,1)+(453,2)+(453,3)) * .04
F453   6    (450,6) + (452,6)
D            NACELLES TOTAL
F454   1    (453,1) * RM NAC
F454   2    (453,2) * RM NAC
F454   3    (453,3) * RM NAC
F454   4    (453,4) * RM NAC
F454   5    (453,5) * RM NAC
D            LABOR COSTS   ($)
F455   7    (453,1)+(453,2)+(453,3)+(453,4)+(453,5)
F455   8    (454,1)+(454,2)+(454,3)+(454,4)+(454,5)
F455   9    (455,8)+(453,6)
D     TOTALS
P
B           (6(3X,F7.0))
F457   1    PN3 LDG * 1.0
D            RECURRING PRODUCTION COSTS
C
C
B           (9(3X,-6PF7.4))
C            LANDING GEAR
T
C
Z458   1 29 301   1       PN2 LDG    PN4 LDG   PC15 LDG
Z458   2 29 301   2       PN2 LDG    PN4 LDG   PC25 LDG
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Z458  6 29 301  6      PN2 LDG   PN4 LDG   PC35 LDG
D       BRAKES
Z459  1 29 302  1      PN2 LDG   PN4 LDG   PC16 LDG
Z459  2 29 302  2      PN2 LDG   PN4 LDG   PC26 LDG
Z459  6 29 302  6      PN2 LDG   PN4 LDG   PC36 LDG
D       BRAKE CONTROLS
Z460  1 29 303  1      PN2 LDG   PN4 LDG   PC17 LDG
Z460  2 29 303  2      PN2 LDG   PN4 LDG   PC27 LDG
Z460  6 29 303  6      PN2 LDG   PN4 LDG   PC37 LDG
D       WHEELS
Z461  1 29 304  1      PN2 LDG   PN4 LDG   PC18 LDG
Z461  2 29 304  2      PN2 LDG   PN4 LDG   PC28 LDG
Z461  6 29 304  6      PN2 LDG   PN4 LDG   PC38 LDG
D       TIRES
Z462  1 29 305  1      PN2 LDG   PN4 LDG   PC19 LDG
Z462  2 29 305  2      PN2 LDG   PN4 LDG   PC29 LDG
Z462  6 29 305  6      PN2 LDG   PN4 LDG   PC39 LDG
D       OLEOS
Z463  1 29 306  1      PN2 LDG   PN4 LDG PC110 LDG
Z463  2 29 306  2      PN2 LDG   PN4 LDG PC210 LDG
Z463  6 29 306  6      PN2 LDG   PN4 LDG PC310 LDG
D       AXLES, TRUNNIONS + FITTINGS
Z464  1 29 307  1      PN2 LDG   PN4 LDG PC111 LDG
Z464  2 29 307  2      PN2 LDG   PN4 LDG PC211 LDG
Z464  6 29 307  6      PN2 LDG   PN4 LDG PC311 LDG
D       DRAG BRACES
Z465  3 29 308  3      PN2 LDG   PN4 LDG PC212 LDG
Z465  6 29 308  6      PN2 LDG   PN4 LDG PC312 LDG
D       ASSEMBLY
R466  1  6  3        8 458 1
C
D            LANDING GEAR SUB-TOTALS
F467  1    (466,1) * RM LDG
F467  2    (466,2) * RM LDG
F467  3    (466,3) * RM LDG
D            LABOR COSTS  ($)
C
F468  1    (466,1) * .1
F468  2    (466,2) * .1
F468  3    (466,3) * .1
F468  6    (466,6) * .1
D            LANDING GEAR REWORK
F469  1    (466,1) + (468,1)
F469  2    (466,2) + (468,2)
F469  3    (466,3) + (468,3)
F469  4    ((469,1)+(469,2)+(469,3)) * .08
F469  5    ((469,1)+(469,2)+(469,3)) * .04
F469  6    (466,6) + (468,6)
D            LANDING GEAR TOTAL
F470  1    (469,1) * RM LDG
F470  2    (469,2) * RM LDG
F470  3    (469,3) * RM LDG
F470  4    (469,4) * RM LDG
F470  5    (469,5) * RM LDG
D            LABOR COSTS  ($)
F471  7    (469,1)+(469,2)+(469,3)+(469,4)+(469,5)
F471  8    (470,1)+(470,2)+(470,3)+(470,4)+(470,5)
F471  9    (471,8)+(469,6)
D     TOTALS
C
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C
B          (5(3X,-6PF7.2),3X,-6PF7.1)
F472   1   (362,1)+(388,1)+(411,1)+(441,1)+(453,1)+(469,1)
F472   2   (362,2)+(388,2)+(411,2)+(441,2)+(453,2)+(469,2)
F472   3   (362,3)+(388,3)+(411,3)+(441,3)+(453,3)+(469,3)
F472   4   (362,4)+(388,4)+(411,4)+(441,4)+(453,4)+(469,4)
F472   5   (362,5)+(388,5)+(411,5)+(441,5)+(453,5)+(469,5)
F472   6   (362,6)+(388,6)+(411,6)+(441,6)+(453,6)+(469,6)
F472   7   (472,1)+(472,2)+(472,3)+(472,4)+(472,5)
D           AIRFRAME STRUCTURE TOTAL
F473   1   (363,1)+(389,1)+(412,1)+(442,1)+(454,1)+(470,1)
F473   2   (363,2)+(389,2)+(412,2)+(442,2)+(454,2)+(470,2)
F473   3   (363,3)+(389,3)+(412,3)+(442,3)+(454,3)+(470,3)
F473   4   (363,4)+(389,4)+(412,4)+(442,4)+(454,4)+(470,4)
F473   5   (363,5)+(389,5)+(412,5)+(442,5)+(454,5)+(470,5)
F473   8   (473,1)+(473,2)+(473,3)+(473,4)+(473,5)
F473   9   (472,7) + (473,8)
D           AIRFRAME LABOR TOTAL  ($)
P
B          (6(3X,F7.0))
F475   1   PN5 WNG * 1.0
D             RECURRING PRODUCTION COSTS
C
C
C           WING
T
C     STRUCTURAL BOX
B          (6(3X,-6PF7.4))
Z476   1 29   31   1      PN2 WNG    PN6 WNG    PC11 WNG
Z476   2 29   31   2      PN2 WNG    PN6 WNG    PC21 WNG
Z476   6 29   31   6      PN2 WNG    PN6 WNG    PC31 WNG
D         RIBS
Z477   1 29   32   1      PN2 WNG    PN6 WNG    PC12 WNG
Z477   2 29   32   2      PN2 WNG    PN6 WNG    PC22 WNG
Z477   6 29   32   6      PN2 WNG    PN6 WNG    PC32 WNG
D         SPARS
Z478   1 29   33   1      PN2 WNG    PN6 WNG    PC13 WNG
Z478   2 29   33   2      PN2 WNG    PN6 WNG    PC23 WNG
Z478   6 29   33   6      PN2 WNG    PN6 WNG    PC33 WNG
D         COVERS
C
Z479   3 29   34   3      PN2 WNG    PN6 WNG    PC24 WNG
Z479   6 29   34   6      PN2 WNG    PN6 WNG    PC34 WNG
D         ASSEMBLY
R480   1  6   3        4 476 1
D           STRUCTURAL BOX SUB-TOTALS
F481   1   (480,1) * RM WNG
F481   2   (480,2) * RM WNG
F481   3   (480,3) * RM WNG
D           LABOR COSTS  ($)
C
C     SECONDARY STRUCTURE
Z482   1 29   38   1      PN2 WNG    PN6 WNG    PC15 WNG
Z482   2 29   38   2      PN2 WNG    PN6 WNG    PC25 WNG
Z482   6 29   38   6      PN2 WNG    PN6 WNG    PC35 WNG
D         LEADING EDGE
Z483   1 29   39   1      PN2 WNG    PN6 WNG    PC16 WNG
Z483   2 29   39   2      PN2 WNG    PN6 WNG    PC26 WNG
Z483   6 29   39   6      PN2 WNG    PN6 WNG    PC36 WNG
D         TRAILING EDGE
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Z484  1  29   40   1       PN2  WNG    PN6  WNG    PC17  WNG
Z484  2  29   40   2       PN2  WNG    PN6  WNG    PC27  WNG
Z484  6  29   40   6       PN2  WNG    PN6  WNG    PC37  WNG
D        AILERONS
Z485  1  29   41   1       PN2  WNG    PN6  WNG    PC18  WNG
Z485  2  29   41   2       PN2  WNG    PN6  WNG    PC28  WNG
Z485  6  29   41   6       PN2  WNG    PN6  WNG    PC38  WNG
D        FAIRINGS
Z486  1  29   42   1       PN2  WNG    PN6  WNG    PC19  WNG
Z486  2  29   42   2       PN2  WNG    PN6  WNG    PC29  WNG
Z486  6  29   42   6       PN2  WNG    PN6  WNG    PC39  WNG
D        TIPS
Z487  1  29   43   1       PN2  WNG    PN6  WNG  PC110  WNG
Z487  2  29   43   2       PN2  WNG    PN6  WNG  PC210  WNG
Z487  6  29   43   6       PN2  WNG    PN6  WNG  PC310  WNG
D        SPOILERS
Z488  1  29   44   1       PN2  WNG    PN6  WNG  PC111  WNG
Z488  2  29   44   2       PN2  WNG    PN6  WNG  PC211  WNG
Z488  6  29   44   6       PN2  WNG    PN6  WNG  PC311  WNG
D        FLAPS + FLAPERONS
Z489  1  29   45   1       PN2  WNG    PN6  WNG  PC112  WNG
Z489  2  29   45   2       PN2  WNG    PN6  WNG  PC212  WNG
Z489  6  29   45   6       PN2  WNG    PN6  WNG  PC312  WNG
D        ATTACHMENT STRUCTURE
Z490  1  29   46   1       PN2  WNG    PN6  WNG  PC113  WNG
Z490  2  29   46   2       PN2  WNG    PN6  WNG  PC213  WNG
Z490  6  29   46   6       PN2  WNG    PN6  WNG  PC313  WNG
D        ACCESS + OTHER DOORS
Z491  1  29   47   1       PN2  WNG    PN6  WNG  PC114  WNG
Z491  2  29   47   2       PN2  WNG    PN6  WNG  PC214  WNG
Z491  6  29   47   6       PN2  WNG    PN6  WNG  PC314  WNG
D        AIR INDUCTION
Z492  1  29   48   1       PN2  WNG    PN6  WNG  PC115  WNG
Z492  2  29   48   2       PN2  WNG    PN6  WNG  PC215  WNG
Z492  6  29   48   6       PN2  WNG    PN6  WNG  PC315  WNG
D        HIGH LIFT DUCTING
Z493  1  29   49   1       PN2  WNG    PN6  WNG  PC116  WNG
Z493  2  29   49   2       PN2  WNG    PN6  WNG  PC216  WNG
Z493  6  29   49   6       PN2  WNG    PN6  WNG  PC316  WNG
D        SLATS
Z494  1  29   50   1       PN2  WNG    PN6  WNG  PC117  WNG
Z494  2  29   50   2       PN2  WNG    PN6  WNG  PC217  WNG
Z494  6  29   50   6       PN2  WNG    PN6  WNG  PC317  WNG
D        HINGES, BRACKETS, SEALS
Z495  1  29   51   1       PN2  WNG    PN6  WNG  PC118  WNG
Z495  2  29   51   2       PN2  WNG    PN6  WNG  PC218  WNG
Z495  6  29   51   6       PN2  WNG    PN6  WNG  PC318  WNG
D        PIVOTS + FOLDS
Z496  1  29   52   1       PN2  WNG    PN6  WNG  PC119  WNG
Z496  2  29   52   2       PN2  WNG    PN6  WNG  PC219  WNG
Z496  6  29   52   6       PN2  WNG    PN6  WNG  PC319  WNG
D        CENTER SECTION
Z497  1  29   53   1       PN2  WNG    PN6  WNG  PC120  WNG
Z497  2  29   53   2       PN2  WNG    PN6  WNG  PC220  WNG
Z497  6  29   53   6       PN2  WNG    PN6  WNG  PC320  WNG
D        OTHER
Z498  3  29   54   3       PN2  WNG    PN6  WNG  PC221  WNG
Z498  6  29   54   6       PN2  WNG    PN6  WNG  PC321  WNG
D        ASSEMBLY
R499  1   6   3        17  482  1
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C
D           SECONDARY STRUCTURE SUB-TOTAL
F500  1     (499,1)  *  RM WNG
F500  2     (499,2)  *  RM WNG
F500  3     (499,3)  *  RM WNG
D            LABOR COSTS   ($)
C
F501  1     (480,1)  +  (498,1)
F501  2     (480,2)  +  (498,2)
F501  3     (480,3)  +  (498,3)
F501  6     (480,6)  +  (498,6)
D            WING SUBTOTAL
F502  1     (501,1)  *  .1
F502  2     (501,2)  *  .1
F502  3     (501,3)  *  .1
F502  6     (501,6)  *  .1
D            WING REWORK
F503  1     (501,1)  +  (502,1)
F503  2     (501,2)  +  (502,2)
F503  3     (501,3)  +  (502,3)
F503  4     ((503,1)+(503,2)+(503,3))  *  .08
F503  5     ((503,1)+(503,2)+(503,3))  *  .04
F503  6     (501,6)  +  (502,6)
D            WING TOTAL
F504  1     (503,1)  *  RM WNG
F504  2     (503,2)  *  RM WNG
F504  3     (503,3)  *  RM WNG
F504  4     (503,4)  *  RM WNG
F504  5     (503,5)  *  RM WNG
D            LABOR COSTS   ($)
B           (9(3X,-6PF7.3))
F505  7     (503,1)+(503,2)+(503,3)+(503,4)+(503,5)
F505  8     (504,1)+(504,2)+(504,3)+(504,4)+(504,5)
F505  9     (505,8)+(503,6)
D     TOTALS
C
P
B           (6(3X,F7.0))
F507  1     PN5 HTL * 1.0
D             RECURRING PRODUCTION COSTS
C
C
C            HORIZONTAL
T
C     STRUCTURAL BOX
B           (6(3X,-6PF7.4))
Z508  1 29 100  1      PN2 HTL    PN6 HTL   PC11 HTL
Z508  2 29 100  2      PN2 HTL    PN6 HTL   PC21 HTL
Z508  6 29 100  6      PN2 HTL    PN6 HTL   PC31 HTL
D         RIBS
Z509  1 29 101  1      PN2 HTL    PN6 HTL   PC12 HTL
Z509  2 29 101  2      PN2 HTL    PN6 HTL   PC22 HTL
Z509  6 29 101  6      PN2 HTL    PN6 HTL   PC32 HTL
D         SPARS
Z510  1 29 102  1      PN2 HTL    PN6 HTL   PC13 HTL
Z510  2 29 102  2      PN2 HTL    PN6 HTL   PC23 HTL
Z510  6 29 102  6      PN2 HTL    PN6 HTL   PC33 HTL
D         COVERS
C
Z511  3 29 103  3      PN2 HTL    PN6 HTL   PC24 HTL
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Z511   6 29 103  6       PN2 HTL    PN6 HTL  PC34 HTL
D          ASSEMBLY
R512   1   6  3          4 508 1
D              STRUCTURAL BOX SUB-TOTALS
F513   1      (512,1) * RM HTL
F513   2      (512,2) * RM HTL
F513   3      (512,3) * RM HTL
D              LABOR COSTS  ($)
C
C      SECONDARY STRUCTURE
Z514   1 29 106  1       PN2 HTL    PN6 HTL  PC15 HTL
Z514   2 29 106  2       PN2 HTL    PN6 HTL  PC25 HTL
Z514   6 29 106  6       PN2 HTL    PN6 HTL  PC35 HTL
D          LEADING EDGE
Z515   1 29 107  1       PN2 HTL    PN6 HTL  PC16 HTL
Z515   2 29 107  2       PN2 HTL    PN6 HTL  PC26 HTL
Z515   6 29 107  6       PN2 HTL    PN6 HTL  PC36 HTL
D          TRAILING EDGE
Z516   1 29 108  1       PN2 HTL    PN6 HTL  PC17 HTL
Z516   2 29 108  2       PN2 HTL    PN6 HTL  PC27 HTL
Z516   6 29 108  6       PN2 HTL    PN6 HTL  PC37 HTL
D          FAIRINGS
Z517   1 29 109  1       PN2 HTL    PN6 HTL  PC18 HTL
Z517   2 29 109  2       PN2 HTL    PN6 HTL  PC28 HTL
Z517   6 29 109  6       PN2 HTL    PN6 HTL  PC38 HTL
D          TIPS
Z518   1 29 110  1       PN2 HTL    PN6 HTL  PC19 HTL
Z518   2 29 110  2       PN2 HTL    PN6 HTL  PC29 HTL
Z518   6 29 110  6       PN2 HTL    PN6 HTL  PC39 HTL
D          ATTACHMENT STRUCTURE
Z519   1 29 111  1       PN2 HTL    PN6 HTL PC110 HTL
Z519   2 29 111  2       PN2 HTL    PN6 HTL PC210 HTL
Z519   6 29 111  6       PN2 HTL    PN6 HTL PC310 HTL
D          ACCESS + OTHER DOORS
Z520   1 29 112  1       PN2 HTL    PN6 HTL PC111 HTL
Z520   2 29 112  2       PN2 HTL    PN6 HTL PC211 HTL
Z520   6 29 112  6       PN2 HTL    PN6 HTL PC311 HTL
D          HINGES, BRACKETS, SEALS
Z521   1 29 113  1       PN2 HTL    PN6 HTL PC112 HTL
Z521   2 29 113  2       PN2 HTL    PN6 HTL PC212 HTL
Z521   6 29 113  6       PN2 HTL    PN6 HTL PC312 HTL
D          PIVOTS + FOLDS
Z522   1 29 114  1       PN2 HTL    PN6 HTL PC113 HTL
Z522   2 29 114  2       PN2 HTL    PN6 HTL PC213 HTL
Z522   6 29 114  6       PN2 HTL    PN6 HTL PC313 HTL
D          CENTER SECTION
Z523   1 29 115  1       PN2 HTL    PN6 HTL PC114 HTL
Z523   2 29 115  2       PN2 HTL    PN6 HTL PC214 HTL
Z523   6 29 115  6       PN2 HTL    PN6 HTL PC314 HTL
D          ELEVATORS
Z524   1 29 116  1       PN2 HTL    PN6 HTL PC115 HTL
Z524   2 29 116  2       PN2 HTL    PN6 HTL PC215 HTL
Z524   6 29 116  6       PN2 HTL    PN6 HTL PC315 HTL
D          BALANCE WEIGHTS
Z525   3 29 117  3       PN2 HTL    PN6 HTL PC216 HTL
Z525   6 29 117  6       PN2 HTL    PN6 HTL PC316 HTL
D          ASSEMBLY
R526   1   6  3         12 514 1
C
D              SECONDARY STRUCTURE SUB-TOTAL
```

```
F527  1    (526,1) * RM HTL
F527  2    (526,2) * RM HTL
F527  3    (526,3) * RM HTL
D           LABOR COSTS  ($)
C
F528  1    (512,1) + (526,1)
F528  2    (512,2) + (526,2)
F528  3    (512,3) + (526,3)
F528  6    (512,6) + (526,6)
C           HORIZONTAL SUBTOTAL
F529  1    (528,1) * .1
F529  2    (528,2) * .1
F529  3    (528,3) * .1
F529  6    (528,6) * .1
D           HORIZONTAL REWORK
F530  1    (528,1) + (529,1)
F530  2    (528,2) + (529,2)
F530  3    (528,3) + (529,3)
F530  4    ((530,1)+(530,2)+(530,3)) * .08
F530  5    ((530,1)+(530,2)+(530,3)) * .04
F530  6    (528,6) + (529,6)
D           HORIZONTAL TOTAL
F531  1    (530,1) * RM HTL
F531  2    (530,2) * RM HTL
F531  3    (530,3) * RM HTL
F531  4    (530,4) * RM HTL
F531  5    (530,5) * RM HTL
D           LABOR COSTS  ($)
B          (9(3X,-6PF7.3))
F532  7    (530,1)+(530,2)+(530,3)+(530,4)+(530,5)
F532  8    (531,1)+(531,2)+(531,3)+(531,4)+(531,5)
F532  9    (532,8)+(530,6)
D     TOTALS
C
P
B          (6(3X,F7.0))
F534  1    PN5 VTL * 1.0
D             RECURRING PRODUCTION COSTS
C
C
C           VERTICAL
T
B          (6(3X,-6PF7.4))
C     STRUCTURAL BOX
Z535  1 29 151  1      PN2 VTL   PN6 VTL   PC11 VTL
Z535  2 29 151  2      PN2 VTL   PN6 VTL   PC21 VTL
Z535  6 29 151  6      PN2 VTL   PN6 VTL   PC31 VTL
D         RIBS
Z536  1 29 152  1      PN2 VTL   PN6 VTL   PC12 VTL
Z536  2 29 152  2      PN2 VTL   PN6 VTL   PC22 VTL
Z536  6 29 152  6      PN2 VTL   PN6 VTL   PC32 VTL
D         SPARS
Z537  1 29 153  1      PN2 VTL   PN6 VTL   PC13 VTL
Z537  2 29 153  2      PN2 VTL   PN6 VTL   PC23 VTL
Z537  6 29 153  6      PN2 VTL   PN6 VTL   PC33 VTL
D         COVERS
C
Z538  3 29 154  3      PN2 VTL   PN6 VTL   PC24 VTL
Z538  6 29 154  6      PN2 VTL   PN6 VTL   PC34 VTL
D         ASSEMBLY
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```
R539   1  6  3        4 535 1
D           STRUCTURAL BOX SUB-TOTALS
F539   1    (538,1) * RM VTL
F539   2    (538,2) * RM VTL
F539   3    (538,3) * RM VTL
D           LABOR COSTS  ($)
C
C     SECONDARY STRUCTURE
Z540   1 29 158  1     PN2 VTL   PN6 VTL   PC15 VTL
Z540   2 29 158  2     PN2 VTL   PN6 VTL   PC25 VTL
Z540   6 29 158  6     PN2 VTL   PN6 VTL   PC35 VTL
D        LEADING EDGE
Z541   1 29 159  1     PN2 VTL   PN6 VTL   PC16 VTL
Z541   2 29 159  2     PN2 VTL   PN6 VTL   PC26 VTL
Z541   6 29 159  6     PN1 VTL   PN6 VTL   PC36 VTL
D        TRAILING EDGE
Z542   1 29 160  1     PN2 VTL   PN6 VTL   PC17 VTL
Z542   2 29 160  2     PN2 VTL   PN6 VTL   PC27 VTL
Z542   6 29 160  6     PN2 VTL   PN6 VTL   PC37 VTL
D        FAIRING
Z543   1 29 161  1     PN2 VTL   PN6 VTL   PC18 VTL
Z543   2 29 161  2     PN2 VTL   PN6 VTL   PC28 VTL
Z543   6 29 161  6     PN2 VTL   PN6 VTL   PC38 VTL
D        TIPS
Z544   1 29 162  1     PN2 VTL   PN6 VTL   PC19 VTL
Z544   2 29 162  2     PN2 VTL   PN6 VTL   PC29 VTL
Z544   6 29 162  6     PN2 VTL   PN6 VTL   PC39 VTL
D        ATTACHMENT STRUCTURE
Z545   1 29 163  1     PN2 VTL   PN6 VTL PC110 VTL
Z545   2 29 163  2     PN2 VTL   PN6 VTL PC210 VTL
Z545   6 29 163  6     PN2 VTL   PN6 VTL PC310 VTL
D        ACCESS + OTHER DOOR
Z546   1 29 164  1     PN2 VTL   PN6 VTL PC111 VTL
Z546   2 29 164  2     PN2 VTL   PN6 VTL PC211 VTL
Z546   6 29 164  6     PN2 VTL   PN6 VTL PC311 VTL
D        HINGES, BRACKETS, SEALS
Z547   1 29 165  1     PN2 VTL   PN6 VTL PC112 VTL
Z547   2 29 165  2     PN2 VTL   PN6 VTL PC212 VTL
Z547   6 29 165  6     PN2 VTL   PN6 VTL PC312 VTL
D        RUDDER
Z548   3 29 166  3     PN2 VTL   PN6 VTL PC213 VTL
Z548   6 29 166  6     PN2 VTL   PN6 VTL PC313 VTL
D        ASSEMBLY
R549   1  6  3        9 540 1
C
D           SECONDARY STRUCTURE SUB-TOTAL
F550   1    (549,1) * RM VTL
F550   2    (549,2) * RM VTL
F550   3    (549,3) * RM VTL
D           LABOR COSTS  ($)
C
F551   1    (539,1) + (549,1)
F551   2    (539,2) + (549,2)
F551   3    (539,3) + (549,3)
F551   6    (539,6) + (549,6)
D           VERTICAL SUBTOTAL
F552   1    (551,1) * .1
F552   2    (551,2) * .1
F552   3    (551,3) * .1
F552   6    (551,6) * .1
```

```
D            VERTICAL REWORK
F553  1     (551,1) + (552,1)
F553  2     (551,2) + (552,2)
F553  3     (551,3) + (552,3)
F553  4     ((553,1)+(553,2)+(553,3)) * .08
F553  5     ((553,1)+(553,2)+(553,3)) * .04
F553  6     (551,6) + (552,6)
D            VERTICAL TOTAL
F554  1     (553,1) * RM VTL
F554  2     (553,2) * RM VTL
F554  3     (553,3) * RM VTL
F554  4     (553,4) * RM VTL
F554  5     (553,5) * RM VTL
D            LABOR COSTS  ($)
B           (9(3X,-6PF7.3))
F555  7     (553,1)+(553,2)+(553,3)+(553,4)+(553,5)
F555  8     (554,1)+(554,2)+(554,3)+(554,4)+(554,5)
F555  9     (555,8)+(553,6)
D     TOTALS
C
P
B           (6(3X,F7.0))
F557  1     PN5 FLG * 1.0
D             RECURRING PRODUCTION COSTS
C
C
C             FUSELAGE
T
C     BASIC STRUCTURE
B            (6(3X,-6PF7.4))
Z558  1 29 201  1      PN2 FLG   PN6 FLG   PC11 FLG
Z558  2 29 201  2      PN2 FLG   PN6 FLG   PC21 FLG
Z558  6 29 201  6      PN2 FLG   PN6 FLG   PC31 FLG
D         FRAMES + BULKHEADS
Z559  1 29 202  1      PN2 FLG   PN6 FLG   PC12 FLG
Z559  2 29 202  2      PN2 FLG   PN6 FLG   PC22 FLG
Z559  6 29 202  6      PN2 FLG   PN6 FLG   PC32 FLG
D         LONGERONS
Z560  1 29 203  1      PN2 FLG   PN6 FLG   PC13 FLG
Z560  2 29 203  2      PN2 FLG   PN6 FLG   PC23 FLG
Z560  6 29 203  6      PN2 FLG   PN6 FLG   PC33 FLG
D         SKINS + STRINGERS
C
B            (6(3X,-6PF7.3))
Z561  3 29 204  3      PN2 FLG   PN6 FLG   PC24 FLG
Z561  6 29 204  6      PN2 FLG   PN6 FLG   PC34 FLG
D         ASSEMBLY
R562  1  6  3         4 558 1
D            BASIC STRUCTURE SUB-TOTALS
F562  1     (561,1) * RM FLG
F562  2     (561,2) * RM FLG
F562  3     (561,3) * RM FLG
D            LABOR COSTS  ($)
C
C     SECONDARY STRUCTURE
B            (6(3X,-6PF7.4))
Z563  1 29 208  1      PN2 FLG   PN6 FLG   PC15 FLG
Z563  2 29 208  2      PN2 FLG   PN6 FLG   PC25 FLG
Z563  6 29 208  6      PN2 FLG   PN6 FLG   PC35 FLG
D         COCKPIT
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2564  1 29 209  1      PN2 FLG   PN6 FLG   PC16 FLG
2564  2 29 209  2      PN2 FLG   PN6 FLG   PC26 FLG
2564  6 29 209  6      PN2 FLG   PN6 FLG   PC36 FLG
D       NOSE LDG GEAR DOOR + BOX
2565  1 29 210  1      PN2 FLG   PN6 FLG   PC17 FLG
2565  2 29 210  2      PN2 FLG   PN6 FLG   PC27 FLG
2565  6 29 210  6      PN2 FLG   PN6 FLG   PC37 FLG
D       WING REACTION BOX
2566  1 29 211  1      PN2 FLG   PN6 FLG   PC18 FLG
2566  2 29 211  2      PN2 FLG   PN6 FLG   PC28 FLG
2566  6 29 211  6      PN2 FLG   PN6 FLG   PC38 FLG
D       TAIL ATTACHMENT
2567  1 29 212  1      PN2 FLG   PN6 FLG   PC19 FLG
2567  2 29 212  2      PN2 FLG   PN6 FLG   PC29 FLG
2567  6 29 212  6      PN2 FLG   PN6 FLG   PC39 FLG
D       WINDSHIELD + CANOPY
2568  1 29 213  1      PN2 FLG   PN6 FLG PC110 FLG
2568  2 29 213  2      PN2 FLG   PN6 FLG PC210 FLG
2568  6 29 213  6      PN2 FLG   PN6 FLG PC310 FLG
D       MAIN LDG GEAR DOOR + BOX
2569  1 29 214  1      PN2 FLG   PN6 FLG PC111 FLG
2569  2 29 214  2      PN2 FLG   PN6 FLG PC211 FLG
2569  6 29 214  6      PN2 FLG   PN6 FLG PC311 FLG
D       FUEL PROVISIONS
2570  1 29 215  1      PN2 FLG   PN6 FLG PC112 FLG
2570  2 29 215  2      PN2 FLG   PN6 FLG PC212 FLG
2570  6 29 215  6      PN2 FLG   PN6 FLG PC312 FLG
D       ENGINE PROVISIONS
2571  1 29 216  1      PN2 FLG   PN6 FLG PC113 FLG
2571  2 29 216  2      PN2 FLG   PN6 FLG PC213 FLG
2571  6 29 216  6      PN2 FLG   PN6 FLG PC313 FLG
D       DUCT PROVISIONS
2572  1 29 217  1      PN2 FLG   PN6 FLG PC114 FLG
2572  2 29 217  2      PN2 FLG   PN6 FLG PC214 FLG
2572  6 29 217  6      PN2 FLG   PN6 FLG PC314 FLG
D       STORES PROVISIONS
2573  1 29 218  1      PN2 FLG   PN6 FLG PC115 FLG
2573  2 29 218  2      PN2 FLG   PN6 FLG PC215 FLG
2573  6 29 218  6      PN2 FLG   PN6 FLG PC315 FLG
D       SPEED BRAKES
2574  1 29 219  1      PN2 FLG   PN6 FLG PC116 FLG
2574  2 29 219  2      PN2 FLG   PN6 FLG PC216 FLG
2574  6 29 219  6      PN2 FLG   PN6 FLG PC316 FLG
D       CABIN FLOORING + SUPPORTS
2575  1 29 220  1      PN2 FLG   PN6 FLG PC117 FLG
2575  2 29 220  2      PN2 FLG   PN6 FLG PC217 FLG
2575  6 29 220  6      PN2 FLG   PN6 FLG PC317 FLG
D       WINDOWS + WINDOW FRAMES
2576  1 29 221  1      PN2 FLG   PN6 FLG PC118 FLG
2576  2 29 221  2      PN2 FLG   PN6 FLG PC218 FLG
2576  6 29 221  6      PN2 FLG   PN6 FLG PC318 FLG
D       DOORS + DOOR FRAMES
2577  3 29 222  3      PN2 FLG   PN6 FLG PC219 FLG
2577  6 29 222  6      PN2 FLG   PN6 FLG PC319 FLG
D       ASSEMBLY
R578  1  6  3        15 563 1
C
D           SECONDARY STRUCTURE SUB-TOTALS
F579  1    (578,1) * RM FLG
F579  2    (578,2) * RM FLG
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F579   3    (578,3) * RM FLG
D            LABOR COSTS   ($)
C
B           (6(3X,-6PF7.3))
F580   1    (562,1) + (578,1)
F580   2    (562,2) + (578,2)
F580   3    (562,3) + (578,3)
F580   6    (562,6) + (578,6)
D            FUSELAGE SUBTOTAL
F581   1    (580,1) * .1
F581   2    (580,2) * .1
F581   3    (580,3) * .1
F581   6    (580,6) * .1
D            FUSELAGE REWORK
F582   1    (580,1) + (581,1)
F582   2    (580,2) + (581,2)
F582   3    (580,3) + (581,3)
F582   4    ((582,1)+(582,2)+(582,3)) * .08
F582   5    ((582,1)+(582,2)+(582,3)) * .04
F582   6    (580,6) + (581,6)
D            FUSELAGE TOTAL
F583   1    (582,1) * RM FLG
F583   2    (582,2) * RM FLG
F583   3    (582,3) * RM FLG
F583   4    (582,4) * RM FLG
F583   5    (582,5) * RM FLG
D            LABOR COSTS   ($)
B           (9(3X,-6PF7.3))
F584   7    (582,1)+(582,2)+(582,3)+(582,4)+(582,5)
F584   8    (583,1)+(583,2)+(583,3)+(583,4)+(583,5)
F584   9    (584,8)+(582,6)
D      TOTALS
C
P
B           (6(3X,F7.0))
F586   1    PN5 NAC * 1.0
D            RECURRING PRODUCTION COSTS
C
C
C           NACELLLES
T
B           (6(3X,-6PF7.4))
C
Z587   1 29 271   1      PN2 NAC     PN6 NAC    PC15 NAC
Z587   2 29 271   2      PN2 NAC     PN6 NAC    PC25 NAC
Z587   6 29 271   6      PN2 NAC     PN6 NAC    PC35 NAC
D         COWLING
Z588   1 29 272   1      PN2 NAC     PN6 NAC    PC16 NAC
Z588   2 29 272   2      PN2 NAC     PN6 NAC    PC26 NAC
Z588   6 29 272   6      PN2 NAC     PN6 NAC    PC36 NAC
D         PYLON
Z589   1 29 273   1      PN2 NAC     PN6 NAC    PC17 NAC
Z589   2 29 273   2      PN2 NAC     PN6 NAC    PC27 NAC
Z589   6 29 273   6      PN2 NAC     PN6 NAC    PC37 NAC
D         MAIN LDG GEAR DOORS + REINFORCEMENT
Z590   3 29 274   3      PN2 NAC     PN6 NAC    PC28 NAC
Z590   6 29 274   6      PN2 NAC     PN6 NAC    PC38 NAC
D         ASSEMBLY
R591   1  6  3         4 567 1
C
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D          NACELLES SUB-TOTALS
F592  1    (591,1) * RM NAC
F592  2    (591,2) * RM NAC
F592  3    (591,3) * RM NAC
D           LABOR COSTS   ($)
C
F593  1    (591,1) * .1
F593  2    (591,2) * .1
F593  3    (591,3) * .1
F593  6    (591,6) * .1
D           NACELLES REWORK
F594  1    (591,1) + (593,1)
F594  2    (591,2) + (593,2)
F594  3    (591,3) + (593,3)
F594  4    ((594,1)+(594,2)+(594,3)) * .08
F594  5    ((594,1)+(594,2)+(594,3)) * .04
F594  6    (591,6) + (593,6)
D           NACELLES TOTAL
F595  1    (594,1) * RM NAC
F595  2    (594,2) * RM NAC
F595  3    (594,3) * RM NAC
F595  4    (594,4) * RM NAC
F595  5    (594,5) * RM NAC
D           LABOR COSTS   ($)
B          (9(3X,-6PF7.3))
F596  7    (594,1)+(594,2)+(594,3)+(594,4)+(594,5)
F596  8    (595,1)+(595,2)+(595,3)+(595,4)+(595,5)
F596  9    (596,8)+(594,6)
D     TOTALS
P
B          (6(3X,F7.0))
F597  1    PN5 LDG * 1.0
D            RECURRING PRODUCTION COSTS
C
C
B          (6(3X,-6PF7.4))
C           LANDING GEAR
T
C
Z598  1 29 301   1      PN2 LDG   PN6 LDG   PC15 LDG
Z598  2 29 301   2      PN2 LDG   PN6 LDG   PC25 LDG
Z598  6 29 301   6      PN2 LDG   PN6 LDG   PC35 LDG
D         BRAKES
Z599  1 29 302   1      PN2 LDG   PN6 LDG   PC16 LDG
Z599  2 29 302   2      PN2 LDG   PN6 LDG   PC26 LDG
Z599  6 29 302   6      PN2 LDG   PN6 LDG   PC36 LDG
D         BRAKE CONTROLS
Z600  1 29 203   1      PN2 LDG   PN6 LDG   PC17 LDG
Z600  2 29 203   2      PN2 LDG   PN6 LDG   PC27 LDG
Z600  6 29 203   6      PN2 LDG   PN6 LDG   PC37 LDG
D         WHEELS
Z601  1 29 304   1      PN2 LDG   PN6 LDG   PC18 LDG
Z601  2 29 304   2      PN2 LDG   PN6 LDG   PC28 LDG
Z601  6 29 304   6      PN2 LDG   PN6 LDG   PC38 LDG
D         TIRES
Z602  1 29 305   1      PN2 LDG   PN6 LDG   PC19 LDG
Z602  2 29 305   2      PN2 LDG   PN6 LDG   PC29 LDG
Z602  6 29 305   6      PN2 LDG   PN6 LDG   PC39 LDG
D         OLEOS
Z603  1 29 306   1      PN2 LDG   PN6 LDG PC110 LDG
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Z603   2  2, 306   2         PN2 LDG    PN6 LDG PC210 LDG
Z603   3  2, 306   6         PN2 LDG    PN6 LDG PC310 LDG
D         AXLES, TRUNNIONS + FITTINGS
Z604   1  2, 307   1         PN2 LDG    PN6 LDG PC111 LDG
Z604   2  2, 307   2         PN2 LDG    PN6 LDG PC211 LDG
Z604   3  2, 307   6         PN2 LDG    PN6 LDG PC311 LDG
D         DRAG BRACES
Z605   2  2, 308   3         PN2 LDG    PN6 LDG PC212 LDG
Z605   3  2, 308   6         PN2 LDG    PN6 LDG PC312 LDG
D         ASSEMBLY
F606   1                8 598  1
C
D            LANDING GEAR SUB-TOTALS
F607   1     (606,1) * RM LDG
F607   2     (606,2) * RM LDG
F607   3     (606,3) * RM LDG
D            LABOR COSTS   ($)
C
F608   1     (606,1)  *  .1
F608   2     (606,2)  *  .1
F608   3     (606,3)  *  .1
F608   6     (606,6)  *  .1
D            LANDING GEAR REWORK
F609   1     (606,1)  +  (608,1)
F609   2     (606,2)  +  (608,2)
F609   3     (606,3)  +  (608,3)
F609   4     ((609,1)+(609,2)+(609,3))  *  .08
F609   5     ((609,1)+(609,2)+(609,3))  *  .04
F609   6     (606,6)  +  (608,6)
D            LANDING GEAR TOTAL
F610   1     (609,1)  * RM LDG
F610   2     (609,2)  * RM LDG
F610   3     (609,3)  * RM LDG
F610   4     (609,4)  * RM LDG
F610   5     (609,5)  * RM LDG
D            LABOR COSTS   ($)
F611   7     (609,1)+(609,2)+(609,3)+(609,4)+(609,5)
F611   8     (610,1)+(610,2)+(610,3)+(610,4)+(610,5)
F611   9     (611,8)+(609,6)
D      TOTALS
C
C
B            (6(3X,-6PF7.2))
F612   1     (503,1)+(530,1)+(553,1)+(582,1)+(594,1)+(609,1)
F612   2     (503,2)+(530,2)+(553,2)+(582,2)+(594,2)+(609,2)
F612   3     (503,3)+(530,3)+(553,3)+(582,3)+(594,3)+(609,3)
F612   4     (503,4)+(530,4)+(553,4)+(582,4)+(594,4)+(609,4)
F612   5     (503,5)+(530,5)+(553,5)+(582,5)+(594,5)+(609,5)
F612   6     (503,6)+(530,6)+(553,6)+(582,6)+(594,6)+(609,6)
F612   7     (612,1)+(612,2)+(612,3)+(612,4)+(612,5)
D            AIRFRAME STRUCTURE TOTAL
F613   1     (504,1)+(531,1)+(554,1)+(583,1)+(595,1)+(610,1)
F613   2     (504,2)+(531,2)+(554,2)+(583,2)+(595,2)+(610,2)
F613   3     (504,3)+(531,3)+(554,3)+(583,3)+(595,3)+(610,3)
F613   4     (504,4)+(531,4)+(554,4)+(583,4)+(595,4)+(610,4)
F613   5     (504,5)+(531,5)+(554,5)+(583,5)+(595,5)+(610,5)
F613   8     (613,1)+(613,2)+(613,3)+(613,4)+(613,5)
F613   9     (612,7)  +  (613,8)
D            AIRFRAME LABOR TOTAL   ($)
P
```

```
N 6
B           (6(3,,-6,,7.3))
1           WING HORZ VERT FUSL NACE  LDG SUB-  TOOL
2                                     GEAR TOTAL LAB
3           HOURSHOURSHOURSHOURSHOURSHOURSHOURSCOSTS
C
C
C                     AEROSPACE VEHICLE STRUCTURAL COSTS
C
C NONRECURRING DESIGN AND DEVELOPMENT COSTS
C
C
T
C
F615  1    EH WNG * WAMPR WNG**.60
F615  2    EH HTL * WAMPR HTL**.60
F615  3    EH VTL * WAMPR VTL**.60
F615  4    EH FLG * WAMPR FLG**.60
F615  5    EH NAC * WAMPR NAC**.60
F615  6    EH LDG * WAMPR LDG**.60
F615  7    (615,1)+(615,2)+(615,3)+(615,4)+(615,5)+(615,6)
F615  8    (615,7) * ECLR WNG
D  BASIC STRUCT DESIGN ENGR
F616  7    (615,7) * 1.15
F616  8    (616,7) * ECLR WNG
D  CONFIGURATION DESIGN ENGR
F617  8    (616,8) * .1
D  ENGINEERING MATERIAL
F618  7    (615,7) + (616,7)
F618  8    (615,8) + (616,8) + (617,8)
D  TOTAL TRADE STUDY ENGR
C
C
C
C
C
C
C
F619  1    TMF WNG * WAMPR WNG**.75
F619  2    TMF HTL * WAMPR HTL**.75
F619  3    TMF VTL * WAMPR VTL**.75
F619  4    TMF FLG * WAMPR FLG**.75
F619  5    TMF NAC * WAMPR NAC**.75
F619  6    TMF LDG * WAMPR LDG**.75
F619  7    (619,1)+(619,2)+(619,3)+(619,4)+(619,5)+(619,6)
D  BASIC TOOL MFG HOURS
F620  7    (619,7) * (TAM WNG**.20 -1.)
D  RATE TOOLING MFG HOURS
F621  7    (619,7) * TAM WNG**.20
F621  8    (621,7) * TMC WNG
D  TOTAL TOOL MFG
F622  7    (619,7) * .4
D  BASIC TOOL ENGRG HOURS
F623  7    (620,7) * .15
D  RATE TOOL ENGRG HOURS
F624  7    (622,7) + (623,7)
F624  8    (624,7) * TEC WNG
D  TOTAL TOOL ENGRG
F625  7    (621,7) * .02
F625  8    (625,7) * TDC WNG
```

```
D   MFG DEVEL + PLANT ENGR
F626  8    (621,7) * 1.0
D   TOOLING MATL + OTHER DOLLARS
F627  8    (616,8) * .1
D   MANUFACTURING SUPPORT DOLLARS
F628  7    (616,7) * .01 + (621,7) * .06
F628  8    (628,7) * RWC WNG
D   QUALITY CONTROL
F629  7    (615,7)+(616,7)+(621,7)+(624,7)+(625,7)+(628,7)
F629  8    (621,8)+(624,8)+(625,8)+(626,8)+(627,8)+(628,8)
D      TOTALS
F
4 9
0            (6(3X,-1PF7.0),3X,-6PF7.3,3X,-6PF7.3,3X,-1PF7.0)
1            WING HORT VERT FUSE NACE  LDG SUB-  DOL PROD
2                                      GEAR TOTAL LAR
3            HOURSHOURSHOURSHOURSHOURSHOURSHOURSCOSTSUNITS
C
C                     AEROSPACE VEHICLE STRUCTURAL COSTS
C
C RECURRING AIRFRAME PRODUCTION COSTS   (SUMMARY)
T
C       ROUTE
C
C
F630  7    (24,1) * ((615,7)+(616,7))
F630  8    (630,7) * ECLF WNG
F630  9    PN2 WNG * 10.
F630 10    (621,7)+(624,7)+(625,7)
D          SUSTAINING ENGRG
F631  7    (25,1) * (630,10)
F631  8    (631,7) * RT WNG
D          SUSTAINING TOOLING
C          MANUFACTURING
C
0            (6(3X,-6PF7.4),3X,-6PF7.3,3X,-6PF7.3,3X,-1PF7.0)
Z632  1 24  59   1      PN2 WNG   PC11 WNG
Z632  2 24 124   1      PN2 HTL   PC11 HTL
Z632  3 24 171   1      PN2 VTL   PC11 VTL
Z632  4 24 227   1      PN2 FLG   PC11 FLG
Z632  5 24 270   1      PN2 NAC   PC15 NAC
Z632  6 24 312   1      PN2 LDG   PC15 LDG
F632  7    (632,1)+(632,2)+(632,3)+(632,4)+(632,5)+(632,6)
F632  8    (632,7) * RM WNG
D          DETAIL FAB
Z633  1 24  59 10       PN2 WNG   PC21 WNG
Z633  2 24 124 10       PN2 HTL   PC21 HTL
Z633  3 24 171 10       PN2 VTL   PC21 VTL
Z633  4 24 227 10       PN2 FLG   PC21 FLG
Z633  5 24 270 10       PN2 NAC   PC25 NAC
Z633  6 24 312 10       PN2 LDG   PC25 LDG
F633  7    (633,1)+(633,2)+(633,3)+(633,4)+(633,5)+(633,6)
F633  8    (633,7) * RM WNG
D          ASSEMBLY
F634  7    ((632,7)+(633,7)) * .12
F634  8    (634,7) * RM WNG
D          PRIMARY ASSY + MAJOR MATE
F635  7    ((632,7)+(633,7)+(634,7)) * .1
F635  8    (635,7) * RGC WNG
D          QUAL CONTROL
```

```
Z636   1 24  59   6      PN2 WNG   PC31 WNG
Z636   2 24 124   6      PN2 HTL   PC31 HTL
Z636   3 24 171   6      PN2 VTL   PC31 VTL
Z636   4 24 227   6      PN2 FLG   PC31 FLG
Z636   5 24 278   6      PN2 NAC   PC35 NAC
Z636   6 24 312   6      PN2 LDG   PC35 LDG
F636   8    (636,1)+(636,2)+(636,3)+(636,4)+(636,5)+(636,6)
D            MATERIAL + OTHER
F637   8    (636,8) * .14
D            MAJOR MATE MATERIAL
F638   7    (630,7)+(631,7)+(632,7)+(633,7)+(634,7)+(635,7)
F638   8    (630,8)+(631,8)+(632,8)+(633,8)+(634,8)+(635,8)+(636,8)+(637,8)
D      TOTALS
C
C
C       PROCUREMENT ARTICLES
C
C
B           (6(3X,-1PF7.0),3X,-6PF7.3,3X,-6PF7.3,3X,-1PF7.0)
F640   7    (26,1) * ((615,7)+(616,7))
F640   8    (640,7) * ECLR WNG
F640   9    PN3 WNG * 10.
D          SUSTAINING ENGRG
F641   7    (27,1) * (630,10)
F641   8    (641,7) * RT WNG
D          SUSTAINING TOOLING
C          MANUFACTURING
C
B           (6(3X,-6PF7.4),3X,-6PF7.3,3X,-6PF7.3,3X,-1PF7.0)
Z642   1 29  59  1      PN2 WNG    PN4 WNG   PC11 WNG
Z642   2 29 124  1      PN2 HTL    PN4 HTL   PC11 HTL
Z642   3 29 171  1      PN2 VTL    PN4 VTL   PC11 VTL
Z642   4 29 227  1      PN2 FLG    PN4 FLG   PC11 FLG
Z642   5 29 278  1      PN2 NAC    PN4 NAC   PC15 NAC
Z642   6 29 312  1      PN2 LDG    PN4 LDG   PC15 LDG
F642   7    (642,1)+(642,2)+(642,3)+(642,4)+(642,5)+(642,6)
F642   8    (642,7) * RM WNG
D             DETAIL FAB
Z643   1 29  59 10      PN2 WNG    PN4 WNG   PC21 WNG
Z643   2 29 124 10      PN2 HTL    PN4 HTL   PC21 HTL
Z643   3 29 171 10      PN2 VTL    PN4 VTL   PC21 VTL
Z643   4 29 227 10      PN2 FLG    PN4 FLG   PC21 FLG
Z643   5 29 278 10      PN2 NAC    PN4 NAC   PC25 NAC
Z643   6 29 312 10      PN2 LDG    PN4 LDG   PC25 LDG
F643   7    (643,1)+(643,2)+(643,3)+(643,4)+(643,5)+(643,6)
F643   8    (643,7) * RM WNG
D             ASSEMBLY
F644   7    ((642,7)+(643,7)) * .12
F644   8    (644,7) * RM WNG
[illegible]   [illegible] ART ASSY + MAJOR MATE
[illegible]   7    ([illegible],7)+([illegible]3,7)+([illegible]4,7)) * .1
[illegible]   [illegible]    ([illegible],7) * [illegible]
[illegible]   [illegible]TROL
[illegible]   [illegible]                       PC31 [illegible]
[illegible]   [illegible] 124   6      PN2 HTL    PN4 HTL   PC31 HTL
Z646   [illegible] 171   6      PN2 VTL    PN4 VTL   PC31 VTL
Z646   4 29 227   6      PN2 FLG    PN4 FLG   PC31 FLG
Z646   5 29 278   6      PN2 NAC    PN4 NAC   PC35 NAC
Z646   6 29 312   6      PN2 LDG    PN4 LDG   PC35 LDG
F646   8    (646,1)+(646,2)+(646,3)+(646,4)+(646,5)+(646,6)
```

```
D           MATERIAL + OTHER
F647  8     (646,8) * .14
D           MAJOR MATE MATERIAL
F648  7     (640,7)+(641,7)+(642,7)+(643,7)+(644,7)+(645,7)
F648  8     (640,8)+(641,8)+(642,8)+(643,8)+(644,8)+(645,8)+(646,8)+(647,8)
D      TOTALS
C
C
C      PROCUREMENT ARTICLES
C
C
M           (6(3X,-1PF7.0),3X,-6PF7.4,3X,-6PF7.3,3X,-1PF7.0)
F650  7     ((28,1)+(28,2)+(28,3)+(28,4)+(28,5)+(28,6)) * (616,7)
F650  8     (650,7) * ECLF WNG
F650  9     PN5 WNG * 10.
D          SUSTAINING ENGRG
F651  7     ((29,1)+(29,2)+(29,3)+(29,4)+(29,5)+(29,6)) * (630,10)
F651  8     (651,7) * RT WNG
D          SUSTAINING TOOLING
C          MANUFACTURING
C
M           (6(3X,-6PF7.4),3X,-6PF7.4,3X,-6PF7.3,3X,-1PF7.0)
Z652  1 29  59  1       PN2 WNG   PN6 WNG   PC11 WNG
Z652  2 29 124  1       PN2 HTL   PN6 HTL   PC11 HTL
Z652  3 29 171  1       PN2 VTL   PN6 VTL   PC11 VTL
Z652  4 29 227  1       PN2 FLG   PN6 FLG   PC11 FLG
Z652  5 29 276  1       PN2 NAC   PN6 NAC   PC11 NAC
Z652  6 29 312  1       PN2 LDG   PN6 LDG   PC11 LDG
F652  7     (652,1)+(652,2)+(652,3)+(652,4)+(652,5)+(652,6)
F652  8     (652,7) * RM WNG
D           DETAIL FAB
Z653  1 29  59 10       PN2 WNG   PN6 WNG   PC21 WNG
Z653  2 29 124 10       PN2 HTL   PN6 HTL   PC21 HTL
Z653  3 29 171 10       PN2 VTL   PN6 VTL   PC21 VTL
Z653  4 29 227 10       PN2 FLG   PN6 FLG   PC21 FLG
Z653  5 29 276 10       PN2 NAC   PN6 NAC   PC21 NAC
Z653  6 29 312 10       PN2 LDG   PN6 LDG   PC21 LDG
F653  7     (653,1)+(653,2)+(653,3)+(653,4)+(653,5)+(653,6)
F653  8     (653,7) * RM WNG
D           ASSEMBLY
F654  7     ((652,7)+(653,7)) * .12
F654  8     (654,7) * RM WNG
D           PRIMARY ASSY + MAJOR MATE
F655  7     ((652,7)+(653,7)+(654,7)) * .1
F655  8     (655,7) * RGC WNG
D           QUAL CONTROL
Z656  1 29  59  6       PN2 WNG   PN6 WNG   PC31 WNG
Z656  2 29 124  6       PN2 HTL   PN6 HTL   PC31 HTL
Z656  3 29 171  6       PN2 VTL   PN6 VTL   PC31 VTL
Z656  4 29 227  6       PN2 FLG   PN6 FLG   PC31 FLG
Z656  5 29 276  6       PN2 NAC   PN6 NAC   PC31 NAC
Z656  6 29 312  6       PN2 LDG   PN6 LDG   PC31 LDG
F656  8     (656,1)+(656,2)+(656,3)+(656,4)+(656,5)+(656,6)
D           MATERIAL + OTHER
F657  8     (656,8) * .14
D           MAJOR MATE MATERIAL
F658  7     (650,7)+(651,7)+(652,7)+(653,7)+(654,7)+(655,7)
F658  8     (650,8)+(651,8)+(652,8)+(653,8)+(654,8)+(655,8)+(656,8)+(657,8)
D      TOTALS
L
```

MODEL CARD EXPLANATION

Z-Card

The Z-card is a general computational form that makes use of a specified equation form described with respect to the terms used in the equation and designated by a "term" code. The results of the computation are added in a specified line and column of the SAV matrix. The composition of the card is as follows:

Column	
1	Z to designate Z-card
2-4	Line number of the SAV matrix
5-7	Column number of the SAV matrix
8-10	Designation of term code being used

The rest of the card, columns 11 thru 80 is divided into seven subfields of 10 columns each. These subfields contain the parameters and coefficients used in the selected term (i.e., equational form). Parameters and coefficients may be punched in any subfield as long as they are read in increasing order: C_1 should precede C_2, and C_2 should precede C_3, etc. Coefficients should contain a decimal point. If an E format is used, it should be right adjusted in the field. Parameters can be made of input variables, calculations recalled from the SAV matrix or the sum of subsequent lines in one column. This composition may be clarified by reference to an example from the above listing. The first use of a Z-card appears on line Z 65, and is illustrated in Figure A-1. The letter Z designates the Z-card. The results of the calculation are to be entered on line 65, column 1, of the SAV matrix. The term code is 29, and its meaning is explained below. The integers 31 followed by 1 with intervening blanks serves to recall the calculation results stored in line 31, column 1 of the SAV matrix. The terms PN1 WNG and PN2 WNG are parameters signifying the range over which the quantity value is to be considered and PN2 is the ending quantity and PN1 is the beginning quantity and PC11 is the applicable learning curve slope expressed in decimal form.

Terms and their codes that are handled by the Z-card are as follows. C_1 denotes coefficients and P_1 denotes parameters. Coefficients are input as real numbers. Parameters can be variables or recalled elements of the matrix or a sum of subsequent lines on a column of the matrix.

CODE	TERM
1	0
2	C_1

COLUMNS

10	20	30	40	50	60	70	80

```
Z65 1 29    31    1    PN1 WNG  PN2 WNG  PC11 WNG
```

Figure A-1. Illustration of the Z-Card.

CODE	TERM
3	P_1
4	$C_1 P_1$
5	$C_1 C_2$
6	$C_1 C_2 P_1$
7	$C_1 P_1^{C_2}$
8	$C_1 C_2 C_3$
9	$C_1 C_2 C_3 P_1$
10	$C_1 C_2 P_1^{C_3}$
11	$C_1 (C_2 P_1)^{C_3}$
12	$C_1 C_2 P_1 (P_2/P_3)^{C_3}$

13 $C_1 \; C_2 \; C_3 \; C_4$

14 $C_1 \; C_2 \; C_3^{\;C_4}$

15 $C_1 \; C_2 \; C_3 \; P_1^{\;C_4}$

16 $C_1 \; C_2 \; (C_3 \; P_1)^{C_4}$

17 $C_1 \; C_2 \; (P_1/C_3)^{C_4}$

18 $C_1 \; P_1 \; P_2$

19 $C_1 \; P_1 \; P_2 \; P_4/P_3$

20 $C_1 \; C_2 \; P_1/P_2$

21 $C_1 \; C_2 \; P_1 \; P_2^{\;C_3}$

22 $C_1 \; C_2 \; P_1^{\;C_3} \; P_2^{\;C_4}$

23 $C1 \;\; C2 \;\; (P1/P2)^{C3}$

24 If $P2 \leq 20$ $\quad P1 \displaystyle\sum_{i=1}^{P2} i^X$

If $P2 > 20$ $\quad P1 \left[\dfrac{P2^{X+1} - 1}{X+1} + \dfrac{P2^X + 1}{2} \right]$

where $X = \dfrac{\ln P3}{\ln 2}$

25 $P1(P2)^{X+1}$

where $X = \dfrac{\ln C1}{\ln 2}$

26 $SAV(LINE, COL) = SAV(LINE, COL) \displaystyle\prod_{i=1}^{I} C_i \prod_{j=1}^{J} P_j$

where I = number of coefficients,

J = number of parameters.

27 $C1 \; C2(P1/P2)^{C3} \, P3^{C4}$

28	$P1\ P2^{N_1}\ N_2 \sum_{n=P_2+1}^{P_2 P_3} n^{N_2}$	
29	Same as Term 21 for P2 > 20 except that P2 can be any value.	

When punching parameters in the subfields, the following rules must be observed.

a. If the parameter is a variable input the input name should be punched in the first 6 columns of the subfield. The last 4 columns are used for the element name. For example

CF1WNG: refers to a value of a particular complexity factor when the element being estimated is the wing.

b. Recalled calculations are designated by punching in the subfield a pair of integers separated by blanks. They may be punched in any columns of the subfield. The first integer is the line number and the second integer is the column number of the recalled calculation.

c. Sum of subsequent lines are specified by punching three integers separated by blanks in the subfield. The first integer is the number of subsequent lines to be summed. The second integer is the starting line number. The third integer is the column number. This parameter is used for totalling.

d. If the recalled calculation belongs to the present line being computed, only the column number need be punched in the subfield. The program will use the line number specified in column 2-4 of this card. The column number may be punched anywhere in the subfield.

e. Parameters can be made of the sum of several parameters when they are specified in the subfields. This does not apply to terms 12, 18, 19, 20, 21 and 22, where P_1 is made up of only one parameter.

f. A recalled calculation is subtracted if the line number of the recalled matrix element is punched as a negative integer.

The program stops processing a Z-card when a blank subfield is encountered. A Z-card may have one continuation card when 7 subfields are not enough to describe the term. For the continuation card, punch a "Z" in column 1, a "C" in column 2, and use the 7 subfields starting in column 11.

F-Card

The F-card is a generalization of the Z-card which permits writing the estimating formula in a Fortran-compatible format rather than specifying a term code. The card format is:

Column	
1	F to designate F-card
2-4	Line number of the SAV matrix
5-7	Column number of the SAV matrix
11-80	Formula.

F-card continuation is permissible for one additional card. The continuation card format is:

Column	
1	F
2	C to designate a continuation card.
11-80	Remainder of formula

Most of the cost model logic is contained on F-cards. R-cards are used as a convenience in some cases and Z-cards are used for formula complications involving equational forms that cannot be handled by the F-card as related to the COSTC driver program.

R-Card

This card is again a special case of the Z-card. The analyst should be familiar with the Z-card before using this card. In the application for this model, it is used to transfer data within the SAV matrix. The discussion can be illustrated by the R-card entry at line R 55. An example is shown in Figure A-2.

Column	
1	R designated R-card
2-4	Line number for SAV matrix recording
5-7	Beginning column number for recording.
8-10	Ending Column number for recording
11-13	Term code selected.

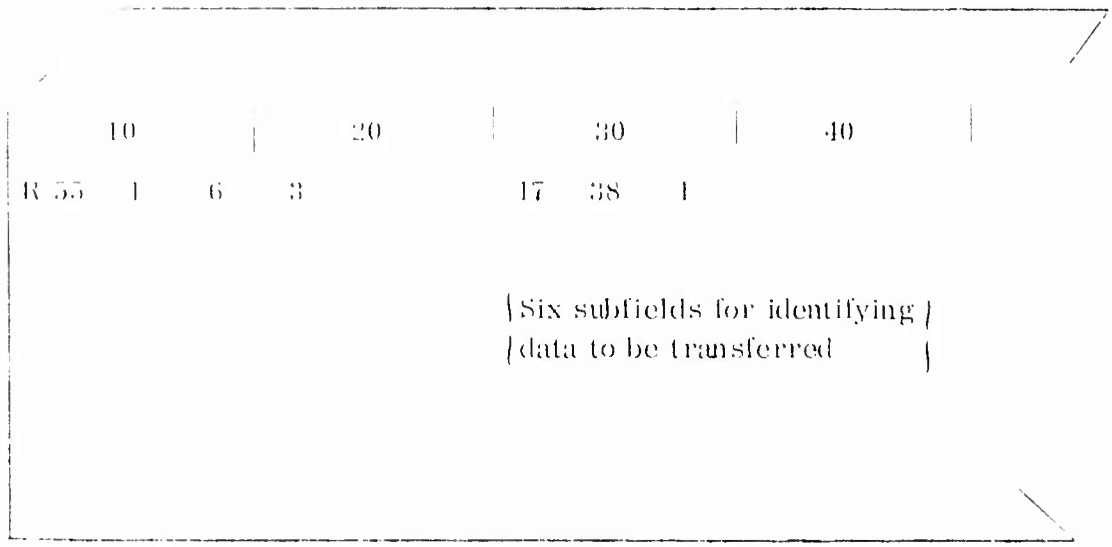

Figure A-2. Illustration of the R-Card.

Column

21-80 Divided into six subfields of 10 columns each.

Thus seventeen lines starting with line 38, (i.e., lines 38, 39, etc.) and starting with column 1 and progressing by column are to be transferred to line 55, starting with column 1 and continuing thru a total of six columns. That is the SAV matrix entries in column 1, lines 38, 39, etc., are summed and added to column 1, line 25. Entries in column 2, lines 38, 39, etc., are summed and added to column 2, line 25 and so forth for six columns. The term code selected, Code 3, indicates that only summation is involved. It can be seen that this application is simply a summing and recording operation.

In general the R-card is used when the coefficients and term code remain constant from column to column throughout a time. An entire line can be calculated with the R-card when the parameter is the only factor that varies, either as a function of the column or the element. As in the Z-card a continuation card may be used when six subfields are not enough to describe the terms.

B-Card

The B-card defines the format used in converting values from the SAV array to the print line. If no B-card has been read, a default format of (12(3X,E7.1)) will be used. A format will remain in effect until another B-card is read with a new format. The format may appear anywhere in cols. 11-80 of the B-card, and should follow

standard FORTRAN IV form. (The word FORMAT is not used.) The format may include scaling factors such as -6P to convert values stored in dollars to print values in $millions. The format must be defined in groups of 10 characters, with the first 3 characters of each group skipped. This is because the output fields are in groups of ten and otherwise would not line up properly under output headings. There must be at least as many groups as there are columns to be printed. Some examples are:

(3X,-6PF7.1)	gives 1 column in $million up to 99999.9
(12(3X,F7.0))	gives up to 12 columns in units up to 9999999
(3X, -6PF7.3,11(3X,F7.0))	gives one column in $million up to 999.999 and up to 11 columns in $million up to 99999.9

<u>1-Card</u>

Contains the first line of column titles. Read in fields of 5 columns starting in column 11.

<u>2-Card</u>

Contains the second line of column titles. Read with the same format as above

<u>3-Card</u>

Contains the third line for column titles. Read as indicated above.

<u>blank-Card</u>

This card will be ignored in the output printout but will be printed in the model card input printout.

<u>C-Card</u>

Comment card. Columns 3 through 80 will be printed.

<u>N-Card</u>

This card contains information related to column printing.

<u>Column</u>

1 N designates N-card

Column (Continued)

2-3 Number of columns that will be printed. The maximum number is 12.

4 When a "P" is punched in this column, the program will sum the columns on each line and print it as one additional column. When 12 columns are already being printed, the 13th column will not be printed for lack of space.

11-80 Any alphanumeric characters used for secondary title.

T-Card

Print titles.

D-Card

This will cause the printing of the line just computed by the preceding Z-cards or R-cards. Columns 3-38 of this card will be printed as the title for that line.

P-Card

Ejects a page.

L-Card

List PL weight matrix and SAV matrix

E-Card

End of case. Will send program to read another title card.

APPENDIX B

INPUT ELEMENTS LISTING

Appendix B consists of a listing showing a computer printout of the input elements used by the cost model. The six basic aircraft airframe elements are provided for. An input value entered in the first column, that is for the wing, is carried across and used for each succeeding element unless a change is introduced on the NAMELIST variable card. The correspondence between NAMELIST entries and the input element listing can be seen by comparing entries in Appendix A and Appendix B.

ELEMENTS

	WNG	HTL	VTL	FLG	NAC	LDG
W1	7.00E+01	0.	4.00E+01	7.66E+02	0.	0.
CF1	5.10E-01	0.	1.00E+00	2.50E+00	0.	0.
W2	2.70E+02	0.	0.	4.28E+02	0.	0.
CF2	9.90E-01	0.	0.	1.00E+00	0.	0.
W3	5.40E+02	0.	0.	0.	0.	0.
CF3	1.00E+00	0.	0.	0.	0.	0.
WT	0.	0.	0.	0.	0.	0.
W4	1.00E+03	0.	6.30E+01	7.97E+02	0.	0.
CF4	6.40E-01	0.	9.90E-01	1.50E+00	0.	0.
W5	6.97E+02	0.	6.30E+01	1.24E+02	0.	0.
CF5	1.72E+00	0.	1.00E+00	1.50E+00	0.	0.
W6	2.50E+02	0.	0.	0.	0.	0.
CF6	1.00E+00	0.	0.	0.	0.	0.
WT1	0.	0.	0.	0.	0.	0.
W7	5.11E+03	0.	5.07E+02	1.11E+03	0.	0.
CF7	3.50E+00	0.	3.50E+00	3.50E+00	0.	0.
W8	0.	0.	0.	3.14E+02	0.	0.
CF8	0.	0.	0.	4.00E+00	0.	0.
W9	0.	0.	0.	0.	0.	0.
CF9	0.	0.	0.	0.	0.	0.
WT2	0.	0.	0.	0.	0.	0.
CM1	2.05E+00	0.	1.00E+00	5.00E-01	0.	0.
CM2	0.	0.	0.	0.	0.	0.
CM3	1.00E+00	0.	0.	0.	0.	0.
CM4	3.84E+00	0.	0.	0.	0.	0.
CM5	0.	0.	1.00E+00	0.	0.	0.
CM6	1.00E+00	0.	0.	0.	0.	0.
CM7	3.50E+00	0.	3.50E+00	3.50E+00	0.	0.
CM8	0.	0.	0.	3.75E+00	0.	0.
CM9	0.	0.	0.	0.	0.	0.
CN	6.00E+01	0.	2.00E+00	7.60E+01	0.	0.
RN	8.00E+00	0.	4.00E+00	1.19E+02	0.	0.
SNF	3.10E+01	0.	6.00E+00	3.60E+01	0.	0.
SNI	0.	0.	0.	0.	0.	0.
SPF	3.00E+01	0.	2.40E+01	9.70E+01	0.	0.
PP	5.00E+01	0.	1.30E+01	2.00E+01	0.	0.
TJ4	0.	0.	0.	0.	0.	0.
TS4	1.00E-01	0.	1.00E-01	1.00E-01	0.	0.
FF1	1.20E+00	0.	1.20E+00	1.20E+00	0.	0.
FF2	2.00E+00	0.	2.00E+00	2.00E+00	0.	0.
CB1	1.75E+00	0.	1.75E+00	2.50E+00	2.26E+00	1.30E+00
WD1	3.49E+02	0.	1.07E+02	2.61E+02	3.57E+03	5.90E+02
CC1	2.00E+00	0.	2.90E+00	2.50E+00	1.50E+00	1.30E+00
CB2	4.00E+00	0.	0.	0.	2.32E+00	1.30E+00
WD2	9.32E+01	0.	0.	0.	1.69E+03	1.14E+02
CC2	4.50E+00	0.	0.	0.	1.50E+00	1.30E+00
CB3	4.50E+00	0.	0.	0.	0.	1.30E+00
WD3	1.14E+03	0.	0.	0.	0.	4.02E+02
CC3	4.75E+00	0.	0.	0.	0.	1.30E+00
CB4	2.70E+00	0.	2.00E+00	0.	0.	1.30E+00
WD4	7.58E+02	0.	2.04E+01	0.	0.	4.99E+02
CC4	2.50E+00	0.	2.00E+00	0.	0.	1.30E+00
CB5	2.50E+00	0.	1.50E+00	2.20E+00	0.	1.30E+00
WD5	2.66E+02	0.	2.55E+01	4.25E+02	0.	1.20E+03
CC5	2.70E+00	0.	1.50E+00	2.13E+00	0.	1.30E+00
CB6	0.	0.	0.	0.	0.	1.30E+00
WD6	0.	0.	0.	0.	0.	5.74E+02

CC6	0.	0.	0.	0.	0.	1.30E+00
CB7	0.	0.	0.	0.	0.	1.30E+00
WD7	0.	0.	0.	0.	0.	2.00E+02
CC7	0.	0.	0.	0.	0.	1.30E+00
CB8	3.00E+00	0.	3.00E+00	0.	0.	0.
WD8	1.01E+02	0.	1.12E+02	0.	0.	0.
CC8	2.31E+00	0.	2.31E+00	0.	0.	0.
CB9	3.00E+00	0.	3.00E+00	0.	0.	0.
WD9	2.37E+02	0.	2.91E+01	0.	0.	0.
CC9	3.00E+00	0.	2.00E+00	0.	0.	0.
CB10	0.	0.	0.	2.00E+00	0.	0.
WD10	0.	0.	0.	1.51E+02	0.	0.
CC10	0.	0.	0.	2.03E+00	0.	0.
CB11	0.	0.	0.	0.	0.	0.
WD11	0.	0.	0.	0.	0.	0.
CC11	0.	0.	0.	0.	0.	0.
CB12	0.	0.	0.	3.00E+00	0.	0.
WD12	0.	0.	0.	3.79E+02	0.	0.
CC12	0.	0.	0.	3.00E+00	0.	0.
CB13	0.	0.	2.50E+00	2.00E+00	0.	0.
WD13	0.	0.	1.62E+01	1.79E+01	0.	0.
CC13	0.	0.	2.50E+00	2.00E+00	0.	0.
CB14	0.	0.	0.	1.92E+00	0.	0.
WD14	0.	0.	0.	3.02E+02	0.	0.
CC14	0.	0.	0.	2.05E+00	0.	0.
CB15	0.	0.	0.	0.	0.	0.
WD15	0.	0.	0.	0.	0.	0.
CC15	0.	0.	0.	0.	0.	0.
CB16	3.00E+00	0.	0.	0.	0.	0.
WD16	9.58E+02	0.	0.	0.	0.	0.
CC16	3.00E+00	0.	0.	0.	0.	0.
CB17	0.	0.	3.50E+00	0.	0.	0.
WD17	0.	0.	2.44E+02	0.	0.	0.
CC17	0.	0.	3.50E+00	0.	0.	0.
WRRP	4.48E+01	0.	1.60E+01	0.	0.	0.
CSO	1.00E+00	0.	1.00E+00	0.	0.	0.
FSL	1.05E+01	0.	1.70E+01	0.	0.	0.
ERL	5.00E+01	0.	3.00E+00	0.	0.	0.
RSL	2.10E+01	0.	1.50E+01	0.	0.	0.
TJ7	0.	0.	0.	0.	0.	0.
TS7	2.00E-01	0.	1.50E-01	0.	0.	0.
FF3	2.50E+00	0.	2.50E+00	0.	0.	0.
CMB	3.00E+00	0.	2.00E+00	3.00E+00	4.50E+00	2.00E+00
AS2	1.89E+03	0.	3.00E+02	1.88E+03	2.26E+03	2.26E+03
RMC1	1.80E+01	0.	1.80E+01	1.80E+01	0.	0.
RMC2	1.60E+01	0.	0.	1.80E+01	0.	0.
RMC3	1.80E+01	0.	0.	0.	0.	0.
SF1	2.00E+00	0.	2.00E+00	5.30E+00	0.	0.
SF2	5.30E+00	0.	0.	5.30E+00	0.	0.
SF3	2.00E+00	0.	0.	0.	0.	0.
RMC4	1.80E+01	0.	1.80E+01	1.80E+01	0.	0.
RMC5	1.80E+01	0.	1.80E+01	1.80E+01	0.	0.
RMC6	1.80E+01	0.	0.	0.	0.	0.
SF4	3.00E+00	0.	5.30E+00	5.30E+00	0.	0.
SF5	5.30E+00	0.	3.00E+00	5.30E+00	0.	0.
SF6	3.00E+00	0.	0.	0.	0.	0.
RMC7	3.60E+01	0.	1.80E+01	3.60E+01	0.	0.
RMC8	0.	0.	0.	3.60E+01	0.	0.
RMC9	0.	0.	0.	0.	0.	0.
SF7	2.00E+00	0.	2.00E+00	5.00E+00	0.	0.
SF8	0.	0.	0.	5.20E+00	0.	0.

SF9	0.	0.	0.	0.	0.	0.
RMC10	5.00E+01	0.	5.00E+01	4.00E+01	5.50E+01	3.20E+02
SF10	1.20E+00	0.	1.20E+00	1.20E+00	2.00E+00	1.00E+00
RMC11	5.50E+01	0.	0.	0.	6.00E+01	3.20E+02
SF11	1.20E+00	0.	0.	0.	2.00E+00	1.00E+00
RMC12	5.50E+01	0.	0.	0.	0.	3.20E+02
SF12	1.20E+00	0.	0.	0.	0.	1.00E+00
RMC13	5.00E+01	0.	5.00E+01	0.	0.	3.20E+02
SF13	1.20E+00	0.	1.20E+00	0.	0.	1.00E+00
RMC14	5.00E+01	0.	3.00E+01	4.00E+01	0.	3.20E+02
SF14	1.20E+00	0.	1.00E+00	1.20E+00	0.	1.00E+00
RMC15	0.	0.	0.	0.	0.	3.20E+02
SF15	0.	0.	0.	0.	0.	1.00E+00
RMC16	0.	0.	0.	0.	0.	3.20E+02
SF16	0.	0.	0.	0.	0.	1.00E+00
RMC17	1.40E+01	0.	4.00E+01	0.	0.	0.
SF17	5.30E+00	0.	1.00E+00	0.	0.	0.
RMC18	5.00E+01	0.	5.00E+01	0.	0.	0.
SF18	3.00E+00	0.	3.00E+00	0.	0.	0.
RMC19	0.	0.	0.	4.00E+01	0.	0.
SF19	0.	0.	0.	1.20E+00	0.	0.
RMC20	0.	0.	0.	0.	0.	0.
SF20	0.	0.	0.	0.	0.	0.
RMC21	0.	0.	0.	4.00E+01	0.	0.
SF21	0.	0.	0.	1.20E+00	0.	0.
RMC22	0.	0.	4.00E+01	4.00E+01	0.	0.
SF22	0.	0.	2.00E+00	1.20E+00	0.	0.
RMC23	0.	0.	0.	4.00E+01	0.	0.
SF23	0.	0.	0.	1.20E+00	0.	0.
RMC24	0.	0.	0.	0.	0.	0.
SF24	0.	0.	0.	0.	0.	0.
RMC25	4.00E+01	0.	0.	0.	0.	0.
SF25	2.00E+00	0.	0.	0.	0.	0.
RMC26	0.	0.	5.00E+01	0.	0.	0.
SF26	0.	0.	1.20E+00	0.	0.	0.
FM1	2.50E+00	0.	2.50E+00	2.50E+00	0.	0.
FM2	1.70E+00	0.	1.70E+00	1.70E+00	0.	0.
EH	5.40E+02	0.	4.00E+02	1.20E+03	1.20E+03	5.60E+02
WAMPR	1.22E+04	0.	1.23E+03	5.07E+03	4.67E+03	3.86E+03
TMF	7.50E+03	0.	3.49E+03	7.20E+03	7.20E+03	1.00E+02
ECLR	6.56E+00	0.	6.56E+00	6.56E+00	6.56E+00	6.56E+00
TAM	3.00E+00	0.	3.00E+00	3.00E+00	3.00E+00	3.00E+00
RM	6.29E+00	0.	6.29E+00	6.29E+00	6.29E+00	6.29E+00
THC	6.26E+00	0.	6.26E+00	6.26E+00	6.26E+00	6.26E+00
TEC	5.94E+00	0.	5.94E+00	5.94E+00	5.94E+00	5.94E+00
TDC	6.00E+00	0.	6.00E+00	6.00E+00	6.00E+00	6.00E+00
ROC	6.84E+00	0.	6.84E+00	6.84E+00	6.84E+00	6.84E+00
RT	6.26E+00	0.	6.26E+00	6.26E+00	6.26E+00	6.26E+00
PN1	1.00E+00	0.	1.00E+00	1.00E+00	1.00E+00	1.00E+00
PN2	3.00E+01	0.	3.00E+01	3.00E+01	3.00E+01	3.00E+01
PN3	8.60E+01	0.	8.60E+01	8.60E+01	8.60E+01	8.60E+01
PN4	1.16E+02	0.	1.16E+02	1.16E+02	1.16E+02	1.16E+02
PN5	0.	0.	0.	0.	0.	0.
PN6	3.00E+01	0.	3.00E+01	3.00E+01	3.00E+01	3.00E+01
PC11	7.00E-01	7.00E-01	7.00E-01	7.00E-01	0.	0.
PC12	7.00E-01	7.00E-01	7.00E-01	7.00E-01	0.	0.
PC13	7.00E-01	7.00E-01	7.00E-01	7.00E-01	0.	0.
PC14	7.00E-01	7.00E-01	7.00E-01	7.00E-01	0.	0.
PC15	7.00E-01	7.00E-01	7.00E-01	7.00E-01	7.00E-01	7.00E-01
PC16	7.00E-01	7.00E-01	7.00E-01	7.00E-01	7.00E-01	7.00E-01
PC17	7.00E-01	7.00E-01	7.00E-01	7.00E-01	7.00E-01	7.00E-01

PC18	7.00E-01	7.00E-01	7.00E-01	7.00E-01	7.00E-01	7.00E-01
PC19	7.00E-01	7.00E-01	7.00E-01	7.00E-01	0.	7.00E-01
PC110	7.00E-01	7.00E-01	7.00E-01	7.00E-01	0.	7.00E-01
PC111	7.00E-01	7.00E-01	7.00E-01	7.00E-01	0.	7.00E-01
PC112	7.00E-01	7.00E-01	7.00E-01	7.00E-01	0.	7.00E-01
PC113	7.00E-01	7.00E-01	7.00E-01	7.00E-01	0.	0.
PC114	7.00E-01	7.00E-01	0.	7.00E-01	0.	0.
PC115	7.00E-01	7.00E-01	0.	7.00E-01	0.	0.
PC116	7.00E-01	7.00E-01	0.	7.00E-01	0.	0.
PC117	7.00E-01	0.	0.	7.00E-01	0.	0.
PC118	7.00E-01	0.	0.	7.00E-01	0.	0.
PC119	7.00E-01	0.	0.	7.00E-01	0.	0.
PC120	7.00E-01	0.	0.	0.	0.	0.
PC121	7.00E-01	0.	0.	0.	0.	0.
PC21	7.00E-01	7.00E-01	7.00E-01	7.00E-01	0.	0.
PC22	7.00E-01	7.00E-01	7.00E-01	7.00E-01	0.	0.
PC23	7.00E-01	7.00E-01	7.00E-01	7.00E-01	0.	0.
PC24	7.00E-01	7.00E-01	7.00E-01	7.00E-01	0.	0.
PC25	7.00E-01	7.00E-01	7.00E-01	7.00E-01	7.00E-01	7.00E-01
PC26	7.00E-01	7.00E-01	7.00E-01	7.00E-01	7.00E-01	7.00E-01
PC27	7.00E-01	7.00E-01	7.00E-01	7.00E-01	7.00E-01	7.00E-01
PC28	7.00E-01	7.00E-01	7.00E-01	7.00E-01	7.00E-01	7.00E-01
PC29	7.00E-01	7.00E-01	7.00E-01	7.00E-01	0.	7.00E-01
PC210	7.00E-01	7.00E-01	7.00E-01	7.00E-01	0.	7.00E-01
PC211	7.00E-01	7.00E-01	7.00E-01	7.00E-01	0.	7.00E-01
PC212	9.50E-01	9.50E-01	9.50E-01	9.50E-01	0.	7.00E-01
PC213	7.00E-01	7.00E-01	7.00E-01	7.00E-01	0.	0.
PC214	7.00E-01	7.00E-01	0.	7.00E-01	0.	0.
PC215	7.00E-01	7.00E-01	0.	7.00E-01	0.	0.
PC216	7.00E-01	7.00E-01	0.	7.00E-01	0.	0.
PC217	7.00E-01	0.	0.	7.00E-01	0.	0.
PC218	7.00E-01	0.	0.	7.00E-01	0.	0.
PC219	7.00E-01	0.	0.	7.00E-01	0.	0.
PC220	7.00E-01	0.	0.	0.	0.	0.
PC221	7.00E-01	0.	0.	0.	0.	0.
PC31	9.50E-01	9.50E-01	9.50E-01	9.50E-01	0.	0.
PC32	9.50E-01	9.50E-01	9.50E-01	9.50E-01	0.	0.
PC33	9.50E-01	9.50E-01	9.50E-01	9.50E-01	0.	0.
PC34	9.50E-01	9.50E-01	9.50E-01	9.50E-01	0.	0.
PC35	9.50E-01	9.50E-01	9.50E-01	9.50E-01	9.50E-01	9.50E-01
PC36	9.50E-01	9.50E-01	9.50E-01	9.50E-01	9.50E-01	9.50E-01
PC37	9.50E-01	9.50E-01	9.50E-01	9.50E-01	9.50E-01	9.50E-01
PC38	9.50E-01	9.50E-01	9.50E-01	9.50E-01	9.50E-01	9.50E-01
PC39	9.50E-01	9.50E-01	9.50E-01	9.50E-01	0.	9.50E-01
PC310	9.50E-01	9.50E-01	9.50E-01	9.50E-01	0.	9.50E-01
PC311	9.50E-01	9.50E-01	9.50E-01	9.50E-01	0.	9.50E-01
PC312	9.50E-01	9.50E-01	9.50E-01	9.50E-01	0.	9.50E-01
PC313	9.50E-01	9.50E-01	9.50E-01	9.50E-01	0.	0.
PC314	9.50E-01	9.50E-01	0.	9.50E-01	0.	0.
PC315	9.50E-01	9.50E-01	0.	9.50E-01	0.	0.
PC316	9.50E-01	9.50E-01	0.	9.50E-01	0.	0.
PC317	9.50E-01	0.	0.	9.50E-01	0.	0.
PC318	9.50E-01	0.	0.	9.50E-01	0.	0.
PC319	9.50E-01	0.	0.	9.50E-01	0.	0.
PC320	9.50E-01	0.	0.	0.	0.	0.
PC321	9.50E-01	0.	0.	0.	0.	0.
WW	0.	0.	0.	0.	0.	0.
WH	0.	0.	0.	0.	0.	0.
WV	0.	0.	0.	0.	0.	0.
WF	0.	0.	0.	0.	0.	0.
WN	0.	0.	0.	0.	0.	0.

APPENDIX C

SAV MATRIX PRINTOUT

An example of the SAV Matrix is shown in Table C-1. The function of this matrix has been explained in various references to it. Line numbering is given. Columns are numbered 1 through 13 from left to right. Column 13 is used strictly for totaling columns 1 through 12.

The example in Table C-1 is for the B-58 test case and, therefore, does not have values for the matirix lines associated with the Horizontal Stabilizer.

Table C-1. SAV Matrix Printout.

SAV MATRIX

5	8.43E+02	2.34E+03	3.80E+02	0.	0.	0.	4.00E+01	0.	4.00E+01	1.19E+03	0.	0.	0.
6	2.03E+03	1.38E+03	1.94E+03	0.	0.	0.	1.25E+02	0.	1.26E+02	9.21E+02	0.	0.	0.
7	1.79E+04	5.13E+03	5.11E+03	0.	0.	0.	1.77E+03	0.	5.07E+02	1.42E+03	0.	0.	0.
8	5.00E+00	5.00E+00	1.00E+01	0.	0.	0.	5.00E+00	0.	7.50E+00	0.	0.	0.	0.
9	0.	5.86E+02	0.	0.	0.	0.	0.	4.00E+01	0.	3.83E+02	0.	0.	0.
10	0.	4.09E+03	0.	0.	0.	0.	0.	6.30E+01	0.	0.	0.	0.	0.
11	0.	1.79E+04	0.	0.	0.	0.	0.	1.77E+03	0.	5.05E+03	0.	0.	0.
12	0.	0.	1.17E+04	0.	0.	1.85E+04	0.	0.	0.	0.	0.	0.	0.
13	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
14	0.	0.	0.	0.	0.	1.31E+03	0.	0.	0.	0.	0.	0.	0.
15	9.57E+02	0.	0.	0.	0.	0.	1.55E+02	1.57E+02	0.	2.12E+01	0.	0.	0.
16	3.49E+03	9.73E+02	2.37E+03	5.33E+03	9.30E+03	1.86E+04	6.91E+04	0.	0.	0.	0.	0.	0.
17	0.	0.	0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
18	1.56E+02	2.25E+02	1.92E+02	4.32E+02	7.53E+02	1.50E+03	5.54E+03	0.	0.	0.	0.	0.	0.
19	1.01E+04	3.90E+03	1.57E+04	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
22	3.94E+03	3.52E+02	1.06E+03	7.11E+02	4.87E+03	1.10E+04	1.91E+04	3.82E+04	1.27E+05	0.	0.	0.	0.
24	9.74E-01	-1.00E+00	9.74E-01	9.74E-01	9.74E-01	9.74E-01	0.	0.	0.	0.	0.	0.	0.
25	6.10E-01	-1.00E+00	6.10E-01	6.10E-01	6.10E-01	6.10E-01	0.	0.	0.	0.	0.	0.	0.
26	6.13E-01	0.	6.13E-01	6.13E-01	6.13E-01	6.13E-01	0.	0.	0.	0.	0.	0.	0.
27	3.36E-01	0.	3.36E-01	3.36E-01	3.36E-01	3.36E-01	0.	0.	0.	0.	0.	0.	0.
28	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
29	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
31	4.59E+03	1.06E+03	0.	0.	0.	1.26E+04	0.	0.	0.	0.	0.	0.	1.83E+04
32	8.91E+03	6.39E+03	0.	0.	0.	2.95E+04	0.	0.	0.	0.	0.	0.	4.48E+04
33	1.13E+04	7.70E+03	0.	0.	0.	5.17E+04	0.	0.	0.	0.	0.	0.	7.11E+04
34	0.	0.	4.30E+04	0.	0.	6.81E+04	0.	0.	0.	0.	0.	0.	1.38E+05
35	2.52E+04	1.51E+04	4.30E+04	0.	0.	1.62E+05	0.	0.	0.	0.	0.	0.	2.42E+05
36	1.59E+05	9.53E+04	2.52E+05	0.	0.	0.	0.	0.	0.	0.	0.	0.	5.06E+05
38	4.85E+03	4.85E+03	0.	0.	0.	5.44E+03	0.	0.	0.	0.	0.	0.	1.52E+04
39	2.42E+03	2.16E+03	0.	0.	0.	2.17E+03	0.	0.	0.	0.	0.	0.	6.75E+03
40	4.25E+04	2.49E+04	0.	0.	0.	1.49E+04	0.	0.	0.	0.	0.	0.	8.23E+04
41	8.26E+03	7.22E+03	0.	0.	0.	9.89E+03	0.	0.	0.	0.	0.	0.	2.54E+04
42	6.32E+03	5.12E+03	0.	0.	0.	4.42E+03	0.	0.	0.	0.	0.	0.	1.59E+04
43	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
44	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
45	1.19E+03	8.91E+02	0.	0.	0.	3.34E+03	0.	0.	0.	0.	0.	0.	5.42E+03
46	1.52E+03	3.26E+03	0.	0.	0.	1.01E+04	0.	0.	0.	0.	0.	0.	1.49E+04
47	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
48	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
49	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
50	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
51	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
52	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
53	1.49E+04	8.95E+03	0.	0.	0.	1.56E+04	1.86E+02	2.96E+04	2.65E+02	0.	3.42E+04	0.	3.97E+04
54	0.	0.	2.39E+04	0.	0.	3.42E+04	0.	0.	0.	0.	0.	0.	6.41E+04
55	8.21E+04	5.73E+04	2.99E+04	0.	0.	1.30E+05	0.	0.	0.	0.	0.	0.	2.70E+05
56	5.15E+05	3.61E+05	1.38E+05	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.36E+06
57	1.07E+05	7.25E+04	6.39E+04	0.	0.	2.62E+05	0.	0.	0.	0.	0.	0.	5.12E+05
58	1.07E+04	7.25E+03	6.99E+03	0.	0.	2.62E+04	0.	0.	0.	0.	0.	0.	5.12E+04
59	1.19E+05	7.97E+04	7.69E+04	2.20E+04	1.10E+04	2.83E+05	0.	0.	0.	1.57E+05	0.	0.	5.56E+05
60	7.43E+05	5.01E+05	4.84E+05	1.38E+05	6.91E+04	0.	0.	0.	0.	0.	0.	0.	1.94E+06
61	0.	0.	0.	0.	0.	0.	3.08E+05	1.94E+06	2.22E+06	0.	0.	0.	4.47E+06
64	3.00E+01	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.00E+01
65	4.27E+04	9.87E+03	0.	0.	0.	3.15E+05	0.	0.	0.	0.	0.	0.	3.68E+05
66	8.28E+04	5.94E+04	0.	0.	0.	7.35E+05	0.	0.	0.	0.	0.	0.	8.78E+05

Table C-1. SAV Matrix Printout (Continued).

67	1.09E+05	7.16E+04	0.	0.	0.	1.29E+05	0.	0.	0.	0.	0.	0.	1.47E+06
68	0.	0.	3.73E+05	0.	0.	1.70E+06	0.	0.	0.	0.	0.	0.	[illegible]
69	2.35E+05	1.41E+05	3.73E+05	0.	0.	4.09E+06	0.	0.	0.	0.	0.	0.	[illegible]
70	1.48E+06	[illegible]	[illegible]	0.	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
71	4.53E+04	4.51E+04	0.	0.	0.	1.36E+05	0.	0.	0.	0.	0.	0.	[illegible]
72	2.29E+04	3.01E+04	0.	0.	0.	5.42E+04	0.	0.	0.	0.	0.	0.	[illegible]
73	3.97E+05	2.31E+05	0.	0.	0.	3.71E+05	0.	0.	0.	0.	0.	0.	[illegible]
74	7.69E+04	6.72E+04	0.	0.	0.	2.47E+05	0.	0.	0.	0.	0.	0.	[illegible]
75	5.88E+04	4.76E+04	0.	0.	0.	1.12E+05	0.	0.	0.	0.	0.	0.	[illegible]
76	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
77	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
78	1.11E+04	2.23E+04	0.	0.	0.	[illegible]	0.	0.	0.	0.	0.	0.	[illegible]
79	1.41E+04	[illegible]	0.	0.	0.	[illegible]	0.	0.	0.	0.	0.	0.	[illegible]
80	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
81	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
82	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
83	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
84	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
85	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
86	1.33E+05	8.33E+04	0.	0.	0.	3.95E+05	0.	0.	0.	0.	0.	0.	[illegible]
87	0.	0.	2.76E+05	0.	0.	5.56E+05	0.	0.	0.	0.	0.	0.	[illegible]
88	7.54E+05	5.43E+05	2.78E+05	0.	0.	2.51E+06	0.	0.	0.	0.	0.	0.	[illegible]
89	4.31E+06	7.44E+06	1.75E+06	0.	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
90	9.33E+05	5.85E+05	5.51E+05	0.	0.	6.55E+06	0.	0.	0.	0.	0.	0.	[illegible]
91	9.33E+04	6.28E+04	[illegible]	0.	0.	6.55E+05	0.	0.	0.	0.	0.	0.	[illegible]
92	1.13E+06	7.57E+05	7.15E+05	2.06E+05	1.03E+05	7.21E+06	0.	0.	0.	0.	0.	0.	1.01E+07
93	6.91E+06	4.76E+06	4.50E+06	1.29E+06	6.47E+05	0.	0.	0.	0.	0.	0.	0.	[illegible]
94	0.	0.	0.	0.	0.	0.	2.59E+06	1.81E+07	2.53E+07	0.	0.	0.	[illegible]
151	[illegible]	1.72E+02	0.	0.	0.	6.16E+02	0.	0.	0.	0.	0.	0.	[illegible]
152	1.32E+03	2.43E+02	0.	0.	0.	7.63E+03	0.	0.	0.	0.	0.	0.	[illegible]
153	2.59E+03	1.64E+03	0.	0.	0.	4.76E+03	0.	0.	0.	0.	0.	0.	[illegible]
154	0.	0.	7.26E+03	0.	0.	5.54E+03	0.	0.	0.	0.	0.	0.	[illegible]
155	4.42E+03	2.05E+03	3.26E+03	0.	0.	1.41E+04	0.	0.	0.	0.	0.	0.	[illegible]
156	2.73E+04	1.24E+04	2.75E+04	0.	0.	0.	0.	0.	0.	0.	0.	0.	5.12E+04
157	2.21E+03	2.20E+03	0.	0.	0.	2.19E+03	0.	0.	0.	0.	0.	0.	[illegible]
158	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
160	5.43E+02	5.13E+02	0.	0.	0.	6.12E+02	0.	0.	0.	0.	0.	0.	1.57E+03
161	7.93E+02	5.93E+02	0.	0.	0.	3.64E+02	0.	0.	0.	0.	0.	0.	1.75E+03
162	1.27E+03	9.52E+02	0.	0.	0.	1.51E+03	0.	0.	0.	0.	0.	0.	3.74E+03
163	2.73E+02	5.36E+02	0.	0.	0.	2.01E+03	0.	0.	0.	0.	0.	0.	2.32E+03
164	4.04E+02	3.39E+02	0.	0.	0.	5.83E+02	0.	0.	0.	0.	0.	0.	1.43E+03
165	3.05E+03	5.57E+03	0.	0.	0.	4.14E+03	9.30E+01	3.90E+03	4.50E+03	4.20E+01	0.	0.	[illegible]
166	0.	0.	7.94E+03	0.	0.	4.53E+03	0.	0.	0.	0.	0.	0.	[illegible]
167	8.65E+03	1.07E+04	3.94E+03	0.	0.	1.60E+04	0.	0.	0.	0.	0.	0.	3.93E+04
168	5.44E+04	6.73E+04	2.49E+04	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.47E+05
169	1.31E+04	1.26E+04	7.20E+03	0.	0.	3.02E+04	0.	0.	0.	0.	0.	0.	5.72E+04
170	1.31E+03	1.26E+03	7.21E+02	0.	0.	3.02E+03	0.	0.	0.	0.	0.	0.	6.72E+03
171	1.44E+04	1.45E+04	7.92E+03	2.91E+03	1.45E+03	3.32E+04	0.	0.	0.	[illegible]	0.	0.	[illegible]
172	9.05E+04	6.82E+04	4.94E+04	1.87E+04	9.14E+03	0.	0.	0.	0.	0.	0.	0.	[illegible]
173	0.	0.	0.	0.	0.	0.	4.07E+04	2.56E+05	2.89E+05	0.	0.	0.	[illegible]
174	3.03E+01	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.03E+01
175	5.62E+03	1.66E+03	0.	0.	0.	1.54E+04	0.	0.	0.	0.	0.	0.	2.25E+04
176	1.23E+04	2.26E+03	0.	0.	0.	9.07E+04	0.	0.	0.	0.	0.	0.	[illegible]
177	2.33E+04	1.52E+04	0.	0.	0.	1.09E+05	0.	0.	0.	0.	0.	0.	1.47E+05
178	0.	0.	3.03E+04	0.	0.	1.33E+05	0.	0.	0.	0.	0.	0.	[illegible]

Table C-1. SAV Matrix Printout (Continued).

179	4.12E+04	1.91E+04	7.03E+04	0.	0.	3.54E+05	0.	0.	0.	0.		0.	4.44E+05
180	2.59E+05	1.24E+05	1.91E+05	0.	0.	0.	0.	0.	0.	0.		0.	5.73E+05
181	2.05E+04	7.05E+04	0.	0.	0.	5.49E+04	0.	0.	0.	0.	0.	0.	9.59E+04
182	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
183	5.09E+03	4.77E+03	0.	0.	0.	1.53E+04	0.	0.	0.	0.	0.	0.	[illegible]
184	7.35E+03	5.51E+03	0.	0.	0.	9.11E+03	0.	0.	0.	0.	0.	0.	[illegible]
185	1.13E+04	8.86E+03	0.	0.	0.	3.74E+04	0.	0.	0.	0.	0.	0.	[illegible]
186	3.47E+03	4.9[illegible]E+03	0.	0.	0.	5.03E+04	0.	0.	0.	0.	0.	0.	[illegible]
187	3.76E+03	3.16E+03	0.	0.	0.	1.71E+04	0.	0.	0.	0.	0.	0.	[illegible]
188	2.85E+04	1.39E+05	0.	0.	0.	1.03E+05	0.	0.	0.	0.	0.	0.	2.71E+05
189	0.	0.	7.66E+04	0.	0.	1.13E+05	0.	0.	0.	0.	0.	0.	[illegible]
190	8.05E+04	1.47E+05	3.56E+04	0.	0.	4.00E+05	0.	0.	0.	0.	0.	0.	[illegible]
191	5.06E+05	[illegible]	2.31E+05	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.91E+06
192	1.22E+05	2.05E+05	6.70E+04	0.	0.	7.64E+05	0.	0.	0.	0.	0.	0.	[illegible]
193	1.27E+04	2.26E+04	6.77E+03	0.	0.	7.84E+04	0.	0.	0.	0.	0.	0.	[illegible]
194	1.34E+05	2.27E+05	7.37E+04	3.47E+04	1.74E+04	6.30E+05	0.	0.	0.	0.	0.	0.	[illegible]
195	6.47E+05	1.43E+06	4.64E+05	2.19E+05	1.09E+05	0.	0.	0.	0.	0.	0.	0.	[illegible]
196	0.	0.	0.	0.	0.	0.	4.86E+05	7.06E+05	3.89E+05	0.	0.	0.	7.43E+06
201	2.26E+04	2.40E+03	0.	0.	0.	2.60E+04	0.	0.	0.	0.	0.	0.	[illegible]
202	1.09E+04	0.	0.	0.	0.	2.03E+04	0.	0.	0.	0.	0.	0.	3.12E+04
203	1.50E+04	2.16E+04	0.	0.	0.	5.54E+04	0.	0.	0.	0.	0.	0.	9.27E+04
204	0.	0.	7.49E+04	0.	0.	1.27E+05	0.	0.	0.	0.	0.	0.	2.32E+05
205	4.85E+04	2.40E+04	7.49E+04	0.	0.	2.29E+05	0.	0.	0.	0.	0.	0.	[illegible]
206	3.30E+05	1.51E+05	4.71E+05	0.	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
207	6.25E+03	3.64E+03	0.	0.	0.	3.49E+03	0.	0.	0.	0.	0.	0.	1.74E+04
209	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
210	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
211	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
212	3.82E+03	4.93E+03	0.	0.	0.	5.08E+03	0.	0.	0.	0.	0.	0.	1.33E+04
213	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
214	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
215	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
216	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
217	1.15E+03	1.17E+03	0.	0.	0.	1.28E+03	0.	0.	0.	0.	0.	0.	4.53E+03
218	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
219	6.41E+03	4.01E+03	0.	0.	0.	4.65E+03	0.	0.	0.	0.	0.	0.	1.51E+04
220	5.57E+02	4.15E+02	0.	0.	0.	4.43E+02	0.	0.	0.	0.	0.	0.	1.41E+03
221	3.96E+03	4.23E+03	0.	0.	0.	3.90E+03	0.	0.	0.	5.34E+02	[illegible].59E+02	0.	1.21E+04
222	0.	0.	1.27E+04	0.	0.	1.47E+04	0.	0.	0.	0.	0.	0.	2.73E+04
223	2.21E+04	1.64E+04	1.27E+04	0.	0.	3.45E+04	0.	0.	0.	0.	0.	0.	5.77E+04
224	1.39E+05	1.16E+05	7.98E+04	0.	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
225	7.05E+04	4.24E+04	3.76E+04	0.	0.	2.63E+05	0.	0.	0.	0.	0.	0.	[illegible]
226	7.05E+03	4.24E+03	8.76E+03	0.	0.	2.64E+04	0.	0.	0.	0.	0.	0.	[illegible]
227	7.77E+04	4.57E+04	9.64E+04	1.77E+04	6.53E+03	2.30E+05	0.	0.	0.	1.43E+05	0.	0.	[illegible]
228	4.89E+05	2.94E+05	5.06E+05	1.11E+05	5.55E+04	0.	0.	0.	0.	0.	0.	0.	1.59E+06
229	0.	0.	0.	0.	0.	0.	2.47E+05	1.55E+06	1.84E+06	0.	0.	0.	[illegible]
232	3.00E+01	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	2.00E+01
235	2.19E+05	2.24E+04	0.	0.	0.	6.50E+05	0.	0.	0.	0.	0.	0.	[illegible]
236	1.01E+05	0.	0.	0.	0.	5.07E+05	0.	0.	0.	0.	0.	0.	[illegible]
237	1.39E+05	2.01E+05	0.	0.	0.	1.33E+06	0.	0.	0.	0.	0.	0.	[illegible]
238	0.	0.	5.97E+05	0.	0.	3.18E+06	0.	0.	0.	0.	0.	0.	[illegible]
239	4.51E+05	2.24E+05	6.97E+05	0.	0.	5.73E+06	0.	0.	0.	0.	0.	0.	[illegible]
240	2.84E+05	1.41E+05	4.76E+05	0.	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
241	5.81E+04	3.39E+04	0.	0.	0.	6.72E+04	0.	0.	0.	0.	0.	0.	1.74E+05
242	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

Table C-1. SAV Matrix Printout (Continued).

243	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
244	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
245	3.59E+04	4.58E+04	0.	0.	0.	1.27E+05	0.	0.	0.	0.	0.	0.	2.08E+05
246	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
247	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
248	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
249	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
250	1.07E+04	1.09E+04	0.	0.	0.	5.71E+04	0.	0.	0.	0.	0.	0.	7.97E+04
251	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
252	5.97E+04	3.73E+04	0.	0.	0.	1.16E+05	0.	0.	0.	0.	0.	0.	2.13E+05
253	5.14E+03	3.86E+03	0.	0.	0.	1.11E+04	0.	0.	0.	0.	0.	0.	2.01E+04
254	3.59E+04	3.94E+04	0.	0.	0.	9.75E+04	0.	0.	0.	0.	0.	0.	1.74E+05
255	0.	0.	1.18E+05	0.	0.	3.67E+05	0.	0.	0.	0.	0.	0.	4.45E+05
256	2.03E+05	1.71E+05	1.18E+05	0.	0.	6.63E+05	0.	0.	0.	0.	0.	0.	1.35E+06
257	1.32E+06	1.06E+06	7.42E+05	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.11E+06
258	6.57E+05	3.95E+05	8.15E+05	0.	0.	6.59E+06	0.	0.	0.	0.	0.	0.	8.45E+05
259	6.57E+04	3.95E+04	9.15E+04	0.	0.	6.59E+05	0.	0.	0.	0.	0.	0.	6.45E+05
260	7.23E+05	4.74E+05	8.97E+05	1.64E+05	8.21E+04	7.25E+06	0.	0.	0.	0.	0.	0.	9.55E+06
261	4.59E+06	2.73E+06	5.64E+06	1.07E+06	5.17E+05	0.	0.	0.	0.	0.	0.	0.	1.45E+07
262	0.	0.	0.	0.	0.	0.	2.30E+06	1.45E+07	2.17E+07	0.	0.	0.	3.45E+07
271	3.83E+04	1.96E+04	0.	0.	0.	5.93E+04	0.	0.	0.	0.	0.	0.	1.13E+05
272	1.54E+04	8.14E+03	0.	0.	0.	2.62E+04	0.	0.	0.	0.	0.	0.	5.07E+04
273	0.	0.	0.	0.	0.	0.	0.	0.	0.	4.66E+03	0.	0.	0.
274	0.	0.	3.89E+04	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.89E+04
275	5.43E+04	2.79E+04	3.89E+04	0.	0.	8.60E+04	0.	0.	0.	0.	0.	0.	2.07E+05
276	3.42E+05	1.76E+05	2.45E+05	0.	0.	0.	0.	0.	0.	0.	0.	0.	7.62E+05
277	5.43E+03	2.79E+03	3.89E+03	0.	0.	8.60E+03	0.	0.	0.	0.	0.	0.	2.07E+04
278	5.93E+04	3.07E+04	4.26E+04	1.07E+04	5.33E+03	9.46E+04	0.	0.	0.	7.35E+04	0.	0.	2.44E+05
279	3.76E+05	1.93E+05	2.69E+05	6.71E+04	3.35E+04	0.	0.	0.	0.	0.	0.	0.	9.39E+05
281	0.	0.	0.	0.	0.	0.	1.49E+05	9.39E+05	1.03E+06	0.	0.	0.	2.12E+06
282	3.02E+01	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.02E+01
285	3.57E+05	1.84E+05	0.	0.	0.	1.50E+06	0.	0.	0.	0.	0.	0.	2.03E+06
286	1.52E+05	7.57E+04	0.	0.	0.	6.55E+05	0.	0.	0.	0.	0.	0.	6.83E+05
287	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
288	0.	0.	3.62E+05	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.62E+05
289	5.05E+05	2.60E+05	3.62E+05	0.	0.	2.15E+06	0.	0.	0.	0.	0.	0.	3.28E+06
290	3.13E+06	1.63E+06	2.28E+06	0.	0.	0.	0.	0.	0.	0.	0.	0.	7.04E+06
291	5.05E+04	2.60E+04	3.62E+04	0.	0.	2.15E+05	0.	0.	0.	0.	0.	0.	3.23E+05
292	5.55E+05	2.86E+05	3.98E+05	9.92E+04	4.96E+04	2.37E+06	0.	0.	0.	0.	0.	0.	3.75E+06
293	3.50E+06	1.80E+06	2.50E+06	6.24E+05	3.12E+05	0.	0.	0.	0.	0.	0.	0.	6.74E+06
294	0.	0.	0.	0.	0.	0.	1.39E+06	8.74E+06	1.11E+07	0.	0.	0.	2.12E+07
301	0.	1.87E+02	0.	0.	0.	4.35E+04	0.	0.	0.	0.	0.	0.	4.37E+04
302	0.	6.27E+01	0.	0.	0.	1.23E+04	0.	0.	0.	0.	0.	0.	1.24E+04
303	0.	3.61E+01	0.	0.	0.	3.24E+04	0.	0.	0.	0.	0.	0.	3.24E+04
304	0.	0.	0.	0.	0.	3.83E+04	0.	0.	0.	0.	0.	0.	3.83E+04
305	0.	3.21E+02	0.	0.	0.	7.53E+04	0.	0.	0.	0.	0.	0.	7.56E+04
306	0.	4.59E+01	0.	0.	0.	4.26E+04	0.	0.	0.	0.	0.	0.	4.27E+04
307	2.26E+02	3.39E+02	0.	0.	0.	1.89E+04	0.	0.	0.	3.58E+03	0.	0.	1.95E+04
308	0.	0.	9.62E+02	0.	0.	0.	0.	0.	0.	0.	0.	0.	9.62E+02
309	2.26E+02	9.71E+02	9.62E+02	0.	0.	2.63E+05	0.	0.	0.	0.	0.	0.	2.65E+05
310	1.42E+03	6.11E+03	6.05E+03	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.36E+04
311	2.25E+01	9.71E+01	9.62E+01	0.	0.	2.63E+04	0.	0.	0.	0.	0.	0.	2.65E+04
312	2.43E+02	1.37E+03	1.06E+03	1.90E+02	9.50E+01	2.90E+05	0.	0.	0.	2.13E+03	0.	0.	2.92E+05
313	1.56E+03	6.72E+03	6.66E+03	1.20E+03	5.95E+02	0.	0.	0.	0.	0.	0.	0.	1.67E+04
314	0.	0.	0.	0.	0.	0.	2.65E+03	1.67E+04	3.05E+05	0.	0.	0.	3.26E+05

Table C-1. SAV Matrix Printout (Continued).

315	2.70E+05	1.72E+05	2.25E+05	5.34E+04	2.67E+04	9.95E+05	7.47E+05	0.	0.	0.	0.	0.	2.49E+06
316	1.70E+05	1.08E+06	1.42E+05	3.36E+05	1.66E+05	0.	0.	4.70E+05	5.45E+06	0.	0.	0.	1.43E+07
317	3.70E+01	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.70E+01
318	0.	1.74E+03	0.	0.	0.	1.09E+05	0.	0.	0.	0.	0.	0.	1.09E+05
319	0.	5.79E+02	0.	0.	0.	3.07E+05	0.	0.	0.	0.	0.	0.	3.08E+05
320	0.	3.36E+02	0.	0.	0.	8.10E+05	0.	0.	0.	0.	0.	0.	8.13E+05
321	0.	0.	0.	0.	0.	9.56E+05	0.	0.	0.	0.	0.	0.	9.56E+05
322	0.	2.80E+03	0.	0.	0.	1.86E+06	0.	0.	0.	0.	0.	0.	1.86E+06
323	0.	4.27E+02	0.	0.	0.	1.07E+06	0.	0.	0.	0.	0.	0.	1.07E+06
324	2.10E+03	3.15E+03	0.	0.	0.	4.73E+05	0.	0.	0.	0.	0.	0.	4.78E+05
325	0.	0.	4.95E+03	0.	0.	0.	0.	0.	0.	0.	0.	0.	4.95E+03
326	2.10E+03	9.34E+03	9.95E+03	0.	0.	6.53E+06	0.	0.	0.	0.	0.	0.	6.63E+06
327	1.32E+04	5.64E+04	5.63E+04	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.26E+05
328	2.13E+02	9.04E+02	9.95E+02	0.	0.	6.58E+05	0.	0.	0.	0.	0.	0.	6.60E+05
329	2.31E+03	3.94E+03	9.85E+03	1.77E+03	8.84E+02	7.24E+06	0.	0.	0.	0.	0.	0.	7.26E+06
330	1.46E+04	6.29E+04	6.19E+04	1.11E+04	5.56E+03	0.	0.	0.	0.	0.	0.	0.	1.56E+05
331	0.	0.	0.	0.	0.	0.	2.48E+04	1.56E+05	7.40E+06	0.	0.	0.	7.58E+06
332	2.51E+05	1.71E+06	2.09E+06	5.06E+05	2.53E+05	2.49E+07	7.08E+05	0.	0.	0.	0.	0.	3.91E+07
333	1.59E+07	1.08E+07	1.32E+07	3.18E+05	1.59E+05	0.	0.	4.45E+07	5.16E+07	0.	0.	0.	1.41E+08
334	8.60E+01	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	8.60E+01
335	4.63E+04	1.07E+04	0.	0.	0.	8.04E+05	0.	0.	0.	0.	0.	0.	8.61E+05
336	8.94E+04	6.45E+04	0.	0.	0.	1.88E+06	0.	0.	0.	0.	0.	0.	2.03E+06
337	1.14E+05	7.77E+04	0.	0.	0.	3.29E+06	0.	0.	0.	0.	0.	0.	3.48E+06
338	0.	0.	4.24E+05	0.	0.	4.33E+06	0.	0.	0.	0.	0.	0.	4.74E+06
339	2.55E+05	1.53E+05	4.04E+05	0.	0.	1.03E+07	0.	0.	0.	0.	0.	0.	1.11E+07
340	1.53E+06	9.62E+05	2.54E+06	0.	0.	0.	0.	0.	0.	0.	0.	0.	5.11E+06
341	4.91E+04	4.90E+04	0.	0.	0.	3.47E+05	0.	0.	0.	0.	0.	0.	4.45E+05
342	2.44E+04	2.16E+04	0.	0.	0.	1.38E+05	0.	0.	0.	0.	0.	0.	1.84E+05
343	4.30E+05	2.51E+05	0.	0.	0.	9.46E+05	0.	0.	0.	0.	0.	0.	1.63E+06
344	8.34E+04	7.29E+04	0.	0.	0.	6.30E+05	0.	0.	0.	0.	0.	0.	7.86E+05
345	6.39E+04	5.17E+04	0.	0.	0.	2.81E+05	0.	0.	0.	0.	0.	0.	3.97E+05
346	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
347	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
348	1.20E+04	5.66E+04	0.	0.	0.	2.13E+05	0.	0.	0.	0.	0.	0.	2.81E+05
349	1.54E+04	3.31E+04	0.	0.	0.	6.43E+05	0.	0.	0.	0.	0.	0.	6.92E+05
350	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
351	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
352	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
353	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
354	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
355	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
356	1.51E+05	9.03E+04	0.	0.	0.	1.01E+06	0.	0.	0.	0.	0.	0.	1.25E+06
357	0.	0.	3.01E+05	0.	0.	2.18E+06	0.	0.	0.	0.	0.	0.	2.48E+06
358	8.29E+05	6.27E+05	3.01E+05	0.	0.	6.38E+06	0.	0.	0.	0.	0.	0.	8.14E+06
359	5.21E+06	3.94E+06	1.90E+06	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.11E+07
360	1.03E+06	7.79E+05	7.96E+05	0.	0.	1.67E+07	0.	0.	0.	0.	0.	0.	1.93E+07
361	1.03E+05	7.79E+04	7.16E+04	0.	0.	1.67E+06	0.	0.	0.	0.	0.	0.	1.93E+06
362	1.19E+06	3.57E+05	7.75E+05	2.26E+05	1.13E+05	1.84E+07	0.	0.	0.	0.	0.	0.	2.15E+07
363	7.50E+05	5.79E+06	4.38E+06	1.42E+06	7.11E+05	0.	0.	0.	0.	0.	0.	0.	1.93E+07
364	0.	0.	0.	0.	0.	0.	3.16E+06	1.99E+07	3.93E+07	0.	0.	0.	6.13E+07
391	8.60E+01	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	8.60E+01
392	6.10E+03	1.73E+03	0.	0.	0.	3.93E+04	0.	0.	0.	0.	0.	0.	4.71E+04
393	1.37E+04	2.45E+03	0.	0.	0.	2.31E+05	0.	0.	0.	0.	0.	0.	2.47E+05
394	2.52E+04	1.65E+04	0.	0.	0.	2.77E+05	0.	0.	0.	0.	0.	0.	3.19E+05
395	0.	0.	3.29E+04	0.	0.	3.53E+05	0.	0.	0.	0.	0.	0.	3.86E+05

Table C-1. SAV Matrix Printout (Continued)

396	4.47E+04	2.07E+04	3.24E+04	0.	0.	9.81E+05	0.	0.	0.	0.	0.	0.	0.	[illegible]
397	2.31E+05	1.3[illegible]E+05	2.07E+05	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]E+05
398	2.23E+04	2.22E+04	0.	0.	0.	1.40E+06	0.	0.	0.	0.	0.	0.	0.	1.[illegible]E+05
399	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
400	[illegible]	[illegible]	0.	0.	0.	3.[illegible]E+04	0.	0.	0.	0.	0.	0.	0.	4.[illegible]
401	7.94E+03	5.9[illegible]E+03	0.	0.	0.	2.[illegible]E+04	0.	0.	0.	0.	0.	0.	0.	5.[illegible]E+04
402	1.24E+04	9.62E+03	0.	0.	0.	[illegible]	0.	0.	0.	0.	0.	0.	0.	[illegible]
403	3.77E+03	5.41E+03	0.	0.	0.	1.[illegible]E+05	0.	0.	0.	0.	0.	0.	0.	[illegible]
404	4.08E+03	3.4[illegible]E+03	0.	0.	0.	4.7[illegible]E+04	0.	0.	0.	0.	0.	0.	0.	[illegible]
405	3.09E+04	3.99E+05	0.	0.	0.	2.[illegible]E+05	0.	0.	0.	0.	0.	0.	0.	6.[illegible]E+05
406	0.	0.	7.29E+04	0.	0.	2.[illegible]E+05	0.	0.	0.	0.	0.	0.	0.	3.07E+05
407	[illegible]	4.[illegible]E+05	3.9[illegible]E+04	0.	0.	1.0[illegible]E+05	0.	0.	0.	0.	0.	0.	0.	1.[illegible]
408	[illegible]E+05	2.[illegible]E+05	2.50E+05	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
409	4.77E+04	4.0[illegible]E+05	7.27E+04	0.	0.	1.[illegible]	0.	0.	0.	0.	0.	0.	0.	[illegible]
410	[illegible]	4.[illegible]E+04	7.27E+03	0.	0.	1.37E+[illegible]	0.	0.	0.	0.	0.	0.	0.	[illegible]
411	[illegible]	4.47E+05	7.[illegible]	4.38E+04	2.49E+04	1.01E+[illegible]	0.	0.	0.	0.	0.	0.	0.	[illegible]
412	6.04E+05	2.[illegible]E+06	[illegible]	7.14E+05	1.57E+05	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
413	0.	0.	0.	0.	0.	0.	6.99E+05	6.39E+05	5.95E+05	0.	0.	0.	0.	[illegible]E+07
415	3.60E+01	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
416	2.29E+05	2.43E+04	0.	0.	0.	1.66E+06	0.	0.	0.	0.	0.	0.	0.	1.[illegible]E+06
417	1.10E+05	0.	0.	0.	0.	1.29E+06	0.	0.	0.	0.	0.	0.	0.	[illegible]E+06
418	1.51E+05	2.15E+05	0.	0.	0.	3.53E+06	0.	0.	0.	0.	0.	0.	0.	[illegible]
419	0.	0.	7.66E+05	0.	0.	[illegible]E+05	0.	0.	0.	0.	0.	0.	0.	[illegible]
420	4.3[illegible]E+05	2.43E+05	7.5[illegible]E+05	0.	0.	1.4[illegible]E+07	0.	0.	0.	0.	0.	0.	0.	1.[illegible]E+07
421	3.29E+06	1.57E+05	4.7[illegible]E+05	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
422	6.30E+04	3.5[illegible]E+04	0.	0.	0.	2.02E+05	0.	0.	0.	0.	0.	0.	0.	[illegible]E+05
423	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
424	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
425	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
426	3.95E+04	4.97E+04	0.	0.	0.	3.24E+05	0.	0.	0.	0.	0.	0.	0.	[illegible]E+05
427	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
428	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
429	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
430	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
431	1.16E+04	1.18E+04	0.	0.	0.	1.45E+05	0.	0.	0.	0.	0.	0.	0.	1.[illegible]E+05
432	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
433	5.47E+04	4.08E+04	0.	0.	0.	2.95E+05	0.	0.	0.	0.	0.	0.	0.	4.[illegible]E+05
434	5.59E+03	4.14E+03	0.	0.	0.	2.50E+04	0.	0.	0.	0.	0.	0.	0.	3.[illegible]E+04
435	4.33E+04	4.27E+04	0.	0.	0.	2.44E+05	0.	0.	0.	0.	0.	0.	0.	3.71E+05
436	0.	0.	1.24E+05	0.	0.	[illegible]E+05	0.	0.	0.	0.	0.	0.	0.	1.[illegible]E+05
437	2.24E+05	1.66E+05	1.24E+0[illegible]	0.	0.	2.2[illegible]E+06	0.	0.	0.	0.	0.	0.	0.	2.[illegible]E+05
438	1.41E+06	1.17E+05	8.[illegible]E+06	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	7.[illegible]E+06
439	7.13E+05	4.24E+05	1.34E+0[illegible]	0.	0.	1.[illegible]	0.	0.	0.	0.	0.	0.	0.	1.[illegible]E+07
440	7.1[illegible]E+04	4.2[illegible]E+04	[illegible]E+04	0.	0.	1.6[illegible]E+0[illegible]	0.	0.	0.	0.	0.	0.	0.	1.[illegible]E+06
441	7.84E+05	4.71E+05	[illegible]	1.79E+05	6.91E+04	1.66E+07	0.	0.	0.	0.	0.	0.	0.	[illegible]E+07
442	4.93E+06	2.96E+06	6.12E+0[illegible]	1.12E+06	5.61E+05	0.	0.	0.	0.	0.	0.	0.	0.	1.[illegible]E+07
443	0.	0.	0.	0.	0.	0.	[illegible]E+06	1.67E+07	3.42E+[illegible]	0.	0.	0.	0.	[illegible]E+07
445	8.50E+01	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]E+01
446	7.33E+05	2.00E+05	0.	0.	0.	7.91E+06	0.	0.	0.	0.	0.	0.	0.	4.[illegible]
447	1.65E+05	9.21E+04	0.	0.	0.	1.67E+06	0.	0.	0.	0.	0.	0.	0.	1.[illegible]
448	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
449	0.	0.	7.93E+05	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.[illegible]E+05
450	5.48E+05	2.82E+05	3.33E+05	0.	0.	5.48E+06	0.	0.	0.	0.	0.	0.	0.	[illegible]E+06
451	3.45E+06	1.77E+06	2.47E+06	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	7.[illegible]E+06
452	5.43E+04	2.82E+04	3.93E+04	0.	0.	5.48E+05	0.	0.	0.	0.	0.	0.	0.	[illegible]E+05

Table C-1. SAV Matrix Printout (Continued).

453	6.37E+05	3.10E+05	4.32E+05	1.36E+05	5.33E+04	6.02E+06	0.	0.	0.	0.	0.	0.	7.53E+06
454	3.79E+06	1.35E+06	2.72E+06	6.77E+05	3.33E+05	0.	0.	0.	0.	0.	0.	0.	4.48E+06
455	0.	0.	0.	0.	0.	0.	1.51E+06	9.48E+06	1.55E+07	0.	0.	0.	2.59E+07
457	6.50E+01	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
458	0.	1.39E+03	0.	0.	0.	2.77E+06	0.	0.	0.	0.	0.	0.	[illegible]
459	0.	6.24E+02	0.	0.	0.	7.83E+05	0.	0.	0.	0.	0.	0.	[illegible]
460	0.	3.65E+02	0.	0.	0.	2.06E+06	0.	0.	0.	0.	0.	0.	[illegible]
461	0.	0.	0.	0.	0.	2.44E+06	0.	0.	0.	0.	0.	0.	[illegible]
462	0.	3.04E+03	0.	0.	0.	4.79E+06	0.	0.	0.	0.	0.	0.	[illegible]
463	0.	4.57E+02	0.	0.	0.	2.71E+06	0.	0.	0.	0.	0.	0.	[illegible]
464	2.34E+03	3.42E+03	0.	0.	0.	1.20E+06	0.	0.	0.	0.	0.	0.	1.21E+06
465	0.	0.	9.71E+03	0.	0.	0.	0.	0.	0.	0.	0.	0.	9.71E+03
466	2.33E+03	9.50E+03	9.71E+03	0.	0.	1.59E+07	0.	0.	0.	0.	0.	0.	[illegible]
467	1.44E+04	6.17E+04	6.11E+04	0.	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
468	2.2[illegible]E+03	9.40E+02	9.71E+02	0.	0.	1.64E+06	0.	0.	0.	0.	0.	0.	[illegible]
469	2.71E+03	1.07E+04	1.07E+04	1.32E+03	9.53E+02	1.34E+07	0.	0.	0.	0.	0.	0.	[illegible]
470	1.58E+04	6.75E+04	6.72E+04	1.21E+04	6.03E+03	0.	0.	0.	0.	0.	0.	0.	[illegible]
471	0.	0.	0.	0.	0.	0.	2.69E+04	1.69E+05	1.36E+07	0.	0.	0.	[illegible]
472	2.58E+05	2.10E+06	2.77E+06	5.64E+05	2.52E+05	6.24E+07	7.39E+06	0.	0.	0.	0.	0.	[illegible]
473	1.6[illegible]E+07	1.32E+07	1.4[illegible]E+07	3.55E+06	1.77E+06	0.	0.	4.96E+07	5.75E+07	0.	0.	0.	[illegible]
515	1.52E+05	0.	7.95E+04	2.01E+05	1.31E+05	7.34E+04	6.52E+05	4.28E+06	0.	0.	0.	0.	[illegible]
516	0.	0.	0.	0.	0.	0.	7.50E+05	4.92E+05	0.	0.	0.	0.	[illegible]
517	0.	0.	0.	0.	0.	0.	0.	4.92E+05	0.	0.	0.	0.	[illegible]
518	0.	0.	0.	0.	0.	0.	1.40E+05	9.64E+06	0.	0.	0.	0.	[illegible]
519	8.69E+05	0.	7.24E+05	4.33E+06	4.37E+05	4.89E+04	1.79E+07	0.	0.	0.	0.	0.	[illegible]
520	0.	0.	0.	0.	0.	0.	4.39E+06	0.	0.	0.	0.	0.	[illegible]
521	0.	0.	0.	0.	0.	0.	2.22E+07	1.39E+03	0.	0.	0.	0.	[illegible]
522	0.	0.	0.	0.	0.	0.	7.14E+06	0.	0.	0.	0.	0.	[illegible]
523	0.	0.	0.	0.	0.	0.	6.54E+05	0.	0.	0.	0.	0.	[illegible]
524	0.	0.	0.	0.	0.	0.	7.4[illegible]E+06	4.63E+07	0.	0.	0.	0.	[illegible]
525	0.	0.	0.	0.	0.	0.	4.45E+05	2.67E+06	0.	0.	0.	0.	[illegible]
526	0.	0.	0.	0.	0.	0.	0.	2.2[illegible]E+07	0.	0.	0.	0.	[illegible]
527	0.	0.	0.	0.	0.	0.	0.	4.92E+05	0.	0.	0.	0.	[illegible]
528	0.	0.	0.	0.	0.	0.	1.34E+06	9.1[illegible]E+05	0.	0.	0.	0.	[illegible]
529	0.	0.	0.	0.	0.	0.	3.30E+07	2.26E+03	0.	0.	0.	0.	[illegible]
530	0.	0.	0.	0.	0.	0.	1.37E+06	5.96E+06	3.06E+02	3.06E+07	0.	0.	[illegible]
531	0.	0.	0.	0.	0.	0.	1.86E+07	1.16E+03	0.	0.	0.	0.	[illegible]
532	1.09E+05	0.	1.33E+05	7.20E+05	5.54E+05	2.30E+03	2.50E+06	1.57E+07	0.	0.	0.	0.	[illegible]
533	1.45E+05	0.	2.03E+05	1.30E+06	6.51E+05	1.97E+04	3.69E+06	2.31E+07	0.	0.	0.	0.	[illegible]
534	0.	0.	0.	0.	0.	0.	7.42E+05	4.47E+06	0.	0.	0.	0.	[illegible]
535	0.	0.	0.	0.	0.	0.	6.32E+05	4.74E+06	0.	0.	0.	0.	[illegible]
536	7.21E+05	0.	4.23E+05	7.25E+06	2.37E+06	7.24E+06	0.	2.4[illegible]E+07	0.	0.	0.	0.	[illegible]
537	0.	0.	0.	0.	0.	0.	0.	3.4[illegible]E+06	0.	0.	0.	0.	[illegible]
538	0.	0.	0.	0.	0.	0.	2.76E+07	[illegible]	0.	0.	0.	0.	[illegible]
540	0.	0.	0.	0.	0.	0.	8.50E+05	5.64E+06	8.60E+02	0.	0.	0.	[illegible]
541	0.	0.	0.	0.	0.	0.	1.02E+07	6.40E+07	0.	0.	0.	0.	7.43E+07
542	1.19E+05	0.	1.45E+05	7.84E+05	6.03E+05	2.51E+03	2.73E+06	1.72E+07	0.	0.	0.	0.	[illegible]
543	1.53E+06	0.	2.22E+05	1.44E+06	7.42E+05	2.15E+04	4.01E+06	2.52E+07	0.	0.	0.	0.	[illegible]
544	0.	0.	0.	0.	0.	0.	8.0[illegible]E+05	5.09E+06	0.	0.	0.	0.	[illegible]
545	0.	0.	0.	0.	0.	0.	7.55E+05	5.16E+06	0.	0.	0.	0.	[illegible]
546	1.84E+07	0.	7.11E+06	1.85E+07	5.02E+06	1.84E+07	0.	6.34E+07	0.	0.	0.	0.	[illegible]
547	0.	0.	0.	0.	0.	0.	0.	3.87E+06	0.	0.	0.	0.	[illegible]
548	0.	0.	0.	0.	0.	0.	1.34E+07	1.35E+08	0.	0.	0.	0.	[illegible]

APPENDIX D

NAMELIST VARIABLES DICTIONARY

Appendix D consists of a definition of the NAMELIST variables used in the trade study estimating method. This is a summary of all such variables used and contains the same items as shown in the computer printout list of elements and to which it corresponds closely. Repetitive patterns are in evidence, and these facilitate input preparation. Section 2.3 gives a more complete discussion of inputs and relates them specifically to the CER equations.

The list of variables is coded to show the general input source. APAS sources are more completely defined in Appendix J. Inputs such as labor rates and learning curve information do not have predetermined sources.

SYMBOL	DESCRIPTION	INPUT SOURCE
First Unit Costs		
W1	Weight of ribs or frames of Type A (lbs)	*1 APAS
W2	Weight of ribs or frames of Type B (lbs)	
W3	Weight of ribs or frames of Type C (lbs)	
W4	Weight of spars or longerons of Type A (lbs)	
W5	Weight of spars or longerons of Type B (lbs)	
W6	Weight of spars or longerons of Type C (lbs)	
W7	Weight of covers of Type A (lbs)	
W8	Weight of covers of Type B (lbs)	
W9	Weight of covers of Type C (lbs)	
CF1	Complexity factor for Type A rib or frame fab	*2 Table 9 or 10
CF2	Complexity factor for Type B rib or frame fab	
CF3	Complexity factor for Type C rib or frame fab	
CF4	Complexity factor for Type A spar or longeron fab	Table 11 or 12
CF5	Complexity factor for Type B spar or longeron fab	
CF6	Complexity factor for Type C spar or longeron fab	
CF7	Complexity factor for Type A cover fab	Table 13 or 14
CF8	Complexity factor for Type B cover fab	
CF9	Complexity factor for Type C cover fab	
WT	WT = W1 + W2 + W3	-
WT1	WT1 = W4 + W5 + W6	-
WT2	WT2 = W7 + W8 + W9	-
CM1	Complexity factor for Type A rib or frame subassembly	Table 16 or 17
CM2	Complexity factor for Type B rib or frame subassembly	
CM3	Complexity factor for Type C rib or frame subassembly	
CM4	Complexity factor for Type A spar or longeron subassembly	Table 18 or 19
CM5	Complexity factor for Type B spar or longeron subassembly	
CM6	Complexity factor for Type C spar or longeron subassembly	
CM7	Complexity factor for Type A cover subassembly	Table 20 or 21
CM8	Complexity factor for Type B cover subassembly	
CM9	Complexity factor for Type C cover subassembly	
CN	Number of cover panels	APAS
RN	Number of ribs, frames	
SNE	Number of external spars, longerons	
SNI	Number of internal spars, longerons	
SPE	Average spar perimeter in feet	
RP	Average rib perimeter in feet	
TJ4	Value calculated within computer	-
TS4	Average skin thickness in inches	APAS
FF1	Factor for fastener selection	Table 23
FF2	Factor for fastener selection	Table 23

SYMBOL	DESCRIPTION	INPUT SOURCE
CB1	Secondary structure component fab complexity	*3Table 25
CB2		
CB3		
CB4		
CB5		
CB6		
CB7		
CB8		
CB9		
CB10		
CB11		
CB12		
CB13		
CB14		
CB15		
CB16		
CB17		
WD1	Component weight (lbs)	*3A PAS
WD2		
WD3		
WD4		
WD5		
WD6		
WD7		
WD8		
WD9		
WD10		
WD11		
WD12		
WD13		
WD14		
WD15		
WD16		
WD17		
CC1	Secondary structure component subassy complexity	*3Table 26
CC2		
CC3		
CC4		
CC5		
CC6		
CC7		
CC8		
CC9		

SYMBOL	DESCRIPTION	INPUT SOURCE
CC10	Secondary structure component subassy complexity	*3Table 26
CC11		
CC12		
CC13		
CC14		
CC15		
CC16		
CC17		
WRRP	Root rib length, (feet)	Design Data
CSO	Center section operator: 1 without, 2 with	
FSL	Front spar length, (feet)	
ERL	End rib length, (feet)	
RSL	Rear spar length, (feet)	
TS7	Average skin thickness, (inches)	
FF3	Factor for fastener selection	Table 23
CMB	Complexity factor for assembly	Table 30
AS2	Surface area of component, (ft^2)	Design Data
RMC1	Raw material cost per lb, rib or frame Type A	Table 31
RMC2	Raw material cost per lb, rib or frame Type B	
RMC3	Raw material cost per lb, rib or frame Type C	
SF1	Scrappage factor, rib or frame Type A	Table 32
SF2	Scrappage factor, rib or frame Type B	
SF3	Scrappage factor, rib or frame Type C	
RMC4	Raw Material cost per pound, spar or longeron Type A	Table 31
RMC5	Raw Material cost per pound, spar or longeron Type B	
RMC6	Raw Material cost per pound, spar or longeron Type C	
SF4	Scrappage factor, spar or longeron Type A	Table 32
SF5	Scrappage factor, spar or longeron Type B	
SF6	Scrappage factor, spar or longeron Type C	
RMC7	Raw material cost per pound, covers Type A	Table 31
RMC8	Raw material cost per pound, covers Type B	
RMC9	Raw material cost per pound, covers Type C	
SF7	Scrappage factor, covers Type A	Table 32
SF8	Scrappage factor, covers Type B	
SF9	Scrappage factor, covers Type C	
RMC10	Material cost per pound, secondary structure	*4Table 33
RMC11		
RMC12		
RMC13		
RMC14		
RMC15		
RMC16		
RMC17		

SYMBOL	DESCRIPTION	INPUT SOURCE
RMC18	Material cost per pound, secondary structure	Table 33
RMC19		
RMC20		
RMC21		
RMC22		
RMC23		
RMC24		
RMC25		
RMC26		
SF10	Scrappage factor, secondary structure	Table 34
SF11		
SF12		
SF13		
SF14		
SF15		
SF16		
SF17		
SF18		
SF19		
SF20		
SF21		
SF22		
SF23		
SF24		
SF25		
SF26		
FM1	Complexity factor for fastener type	Table 36
FM2		
RM	Manufacturing labor rate	Estimated

Nonrecurring Design and Development

EH	Empirical estimating coefficient	Table 39
WAMPR	AMPR weight of structural component (lbs)	APAS
ECLR	Composite engineering labor rate	Estimated
TMF	Empirical estimating coefficient	Table 40
TAM	Monthly production rate	Prog. Data
THC	Tool Manufacturing labor cost	Estimated
TEC	Tool engineering labor cost	
TDC	Composite labor rate	
RQC	Quality control labor rate	

Recurring Production Cost Summary

RT	Composite tooling labor rate	Estimated

SYMBOL	DESCRIPTION	INPUT SOURCE
Recurring Production Cost by Structural Element		
PN1	Quantity estimated, unit No. 1	Prog. Data
PN2	Quantity estimated, RDT&E units	
PN3	Quantity estimated, production quantity 1	
PN4	PN4 = PN2 + PN3	
PN5	Quantity estimated, production quantity 2	
PN6	PN6 = PN2 + PN5	

See following pages for learning curve definitions.

RECURRING PRODUCTION COST BY STRUCTURAL ELEMENT

HARDWARE ELEMENT

SYMBOL	WING	HORIZONTAL	VERTICAL	FUSELAGE	NACELLE	LANDING GEAR
PC11	Ribs	Ribs	Ribs	Frames	Not Used	Not Used
PC12	Spars	Spars	Spars	Longerons		
PC13	Covers	Covers	Covers	Covers		
PC14	Not Used	Not Used	Not Used	Not Used		
PC15	Leading Edge	Leading Edge	Leading Edge	Cockpit	Cowling	[illegible]
PC16	Trailing Edge	Trailing Edge	Trailing Edge	Nose LG Door	Pylon	[illegible]
PC17	Ailerons	Fairings	Fairing	Wing Box	Main LG Door	Wheels
PC18	Fairings	Tips	Tips	Tail Attach.	Not Used	Tires
PC19	Tips	Attach. Struc.	Attach. Struc.	Windshield		Oleos
PC110	Spoilers	Access	Access	Main LG Door		Axles
PC111	Flaps	Hinges	Hinges	Fuel Provisions		Drag Braces
PC112	Attach Struc	Pivots	Rudder	Engine Prov.		Not Used
PC113	Access Doors	Center Section	Not Used	Duct Provisions		
PC114	Air Induction	Elevators		Stores Prov.		
PC115	High Lift Ductg	Balance Wts		Speed Brakes		
PC116	Slats	Not Used		Cabin Flooring		
PC117	Hinges			Windows		
PC118	Pivots & Folds			Doors		
PC119	Center Section			Not Used		
PC120	Other					
PC121	Not Used					

Learning for detail fabrication for primary and secondary structure.

RECURRING PRODUCTION COST BY STRUCTURAL ELEMENT

HARDWARE ELEMENT

SYMBOL	WING	HORIZONTAL	VERTICAL	FUSELAGE	NACELLE	LANDING GEAR
PC21	Ribs	Ribs	Ribs	Frames	Not Used	Not Used
PC22	Spars	Spars	Spars	Longerons		
PC23	Covers	Covers	Covers	Covers		
PC24	Assembly	Assembly	Assembly	Assembly		
PC25	Leading Edge	Leading Edge	Leading Edge	Cockpit	Cowling	Brakes
PC26	Trailing Edge	Trailing Edge	Trailing Edge	Nose LG Door	Pylon	Brake Controls
PC27	Ailerons	Fairings	Fairing	Wing Box	Main LG Door	Wheels
PC28	Fairings	Tips	Tips	Tail Attach.	Assembly	Tires
PC29	Tips	Attach. Struc.	Attach. Struc.	Windshield	Not Used	Oleo
PC210	Spoilers	Access	Access	Main LG Door		Axles
PC211	Flaps	Hinges	Hinges	Fuel Provisions		Drag Braces
PC212	Attach. Struc.	Pivots	Rudder	Engine Prov.		Assembly
PC213	Access Doors	Center Section	Assembly	Duct Provisions		Not Used
PC214	Air Induction	Elevators	Not Used	Stores Prov		
PC215	High Lift Ductg	Balance Wts		Speed Brakes		
PC216	Slats	Assembly		Cabin Flooring		
PC217	Hinges	Not Used		Windows		
PC218	Pivots & Folds			Doors		
PC219	Center Section			Assembly		
PC220	Other			Not Used		
PC221	Assembly					

Learning for subassembly for primary and secondary structure and for major assembly of primary and secondary structure.

RECURRING PRODUCTION COST BY STRUCTURAL ELEMENT

HARDWARE ELEMENT

SYMBOL	WING	HORIZONTAL	VERTICAL	FUSELAGE	NACELLE	LANDING GEAR
PC31						
PC32						
PC33						
PC34						
PC35						
PC36						
PC37						
PC38						
PC39						
PC310						
PC311						
PC312						
PC313						
PC314						
PC315						
PC316						
PC317						
PC318						
PC319						
PC320						
PC321						

Learning for production material.

This chart is identical to the one for subassembly as far as hardware components are concerned. Only the series of input symbols changes.

LEARNING IS ENTERED AS A DECIMAL FRACTION

*1 See Appendix J

*2 First table is for aerodynamic surfaces, second is for fuselage

*3 Secondary structure components are numbered by hardware element. i.e., wing, horizontal, etc. See Figure 29.

*4 The computer program adds 9 (since 9 places are used for primary structure) to the numbering sequence for secondary structure, Figure 32.

APPENDIX E

SUMMARY OF F-CARD VARIABLES

The following summary provides a track of model card coefficients from the model card listing to the relevant CER equation and back-up data reference.

MODEL CARD	DESCRIPTION	EQUATION NO.	REFERENCE
Preliminary Operations:			
F 8 1	Joint thickness ratio: TJ4 = 2 TS + .04	(1)	Volume 1
F 12 3,6,9	Weight scaling exponent, G	(16)	Page II-1
F 13 3,6,9	Same as F 12 3,6,9		
F 14 3,6,9	Same as F 12 3,6,9		
F 15 1,4,7	Quantity scaling exponent, Q	(3)	Table 24
F 15 1,4,7	Size scaling exponent, R	(6)	Table 24
F 15 8-10	Assembly hours factor, HSA 2	(3)	Table 24
F 16 1	Assembly hours factor, HSA 1	(3)	Table 24
F 16 1	(2) Multiplier for dual surfaces	(3)	–
F 16 2	Fit and trim factor, hours per lineal ft., HT	(4)	Table 24
F 16 3	Assembly hours factor, HL	(6)	Table 24
F 16 4	Assembly hours factor, HD	(7)	Table 24
F 16 5	Assembly hours factor, HE	(8)	Table 24
F 16 6	Assembly hours factor, HFI	(9)	Table 24
F 16 7	Assembly material factor, AMF1	(18)	Table 35
F 17 1	Same as F 16 1		
F 17 2	Same as F 16 2		
F 17 3	Same as F 16 3		
F 17 4	Same as F 16 4		
F 17 5	Same as F 16 5		
F 17 6	Same as F 16 6		
F 17 7	Same as F 16 7		
F 18 1-7	Same as F 16 1-7		
F 19 1-3	Weight scaling exponent, G, is used		
F 22 1	Q and R are used		
F 22 2	HSA 2 is used		
F 22 3-8	Same as F 16 1-7		
F 22 9	Same as F 16 7		
F 24 1-6	Multiplication by 1 as an operation to effect entry in the SAV matrix		
F 24 1-6	Exponent 0.20, sustaining engineering scaling with quantity	(40)	
F 25 1-6	Exponent 0.14, sustaining tooling scaling with quantity	(41)	
F 26 1-6	Same as F 24		
F 27 1-6	Same as F 25		
F 28 1-6	Same as F 24		
F 29 1-6	Same as F 25		

MODEL CARD	DESCRIPTION	EQUATION NO.	REFERENCE
Wing First Unit Cost:			
F 31 1	Reference cost per pound factor, HF 1	(1)	Table 15
F 31 1	Scaling exponent, E 1	(1)	Table 15
F 31 2	Reference cost per pound factor, HF 4	(2)	Table 22
F 31 2	Scaling exponent, E 4	(2)	Table 22
F 31 6	Scaling exponent, G	(16)	Page H-1
F 32 1,2,6	Same as F 31 1,2,6, except HF 2, HF 5 etc.		
F 33 1,2,6	Same as F 31 1,2,6, except HF 3, HF 6 etc.		
F 38 1	Reference cost per pound factor, WC 1	(10)	Table 27
F 38 1	Scaling exponent, E 7	(11)	Table 27
F 38 2	Reference cost per pound factor, WF 1	(11)	Table 28
F 38 2	Scaling exponent, E 1	(11)	Table 28
F 38 6	Same as F 31 6		
F 39 1,2,6	Same as F 38 1,2,6		
F 40 1,2,6			
F 41 1,2,6			
F 42 1,2,6			
F 43 1,2,6			
F 44 1,2,6			
F 45 1,2,6			
F 46 1,2,6			
F 47 1,2,6			
F 48 1,2,6			
F 49 1,2,6			
F 50 1,2,6			
F 51 1,2,6			
F 52 1,2,6			
F 53 1,2,6			
F 53 7	Cost per unit length for assembly, HE 1	(12)	Table 29
F 53 8	(2.0) multiplier to give dual dimension	(12)	--
F 53 8	Size scaling parameter, WR	(12)	Table 29
F 53 9	Hours per square foot for finishing	(13)	Table 29
F 53 11	Assembly material cost per labor hour factor	(19)	Table 35
F 59 4	Factor for primary assembly	(20)	-
F 59 5	Factor for major mate	(21)	-
Horizontal Stabilizer First Unit Cost:			
F101 1 thru F118 10	Repeats the above sequence, except that fewer secondary structure components are involved. See Appendix D, under Recurring Production Cost by Structural Element, for discussion of these differences.		

MODEL CARD	DESCRIPTION	EQUATION NO.	REFERENCE
Vertical Stabilizer First Unit Cost:			
F151 1 thru F171 5	Same comment as above		
Fuselage First Unit Cost:			
F201 1 thru F227 5	Follows the same sequence as for aerodynamic surfaces, except that F222 3 has the term: RHP, reference hours per pound, Equation (14) rather than (12)	(14)	Table 29
Nacelles First Unit Cost:			
F271 1 thru F278 5	Follows the same sequence as for the fuselage starting with secondary structure. See Appendix E.		
Landing Gear First Unit Cost:			
F301 1 thru F312 5	Same comment as Nacelles		
Recurring Production Costs RDT&E:			
Wing			
F 92 4	Factor for primary assembly	(20)	
F 92 5	Factor for major mate	(21)	
Horizontal			
F149 4	Factor for primary assembly	(20)	
F149 5	Factor for major mate	(21)	
Vertical			
F194 4	Factor for primary assembly	(20)	
F194 5	Factor for major mate	(21)	
Fuselage			
F260 4	Factor for primary assembly	(20)	
F260 5	Factor for major mate	(21)	

MODEL CARD	DESCRIPTION	EQUATION NO.	REFERENCE
Recurring Production Costs RDT&E (Cont)			
Nacelles			
F292 4	Factor for primary assembly	(20)	
F292 5	Factor for major mate	(21)	
Landing Gear			
F329 4	Factor for primary assembly	(20)	
F329 5	Factor for major mate	(21)	

Recurring Production Costs:

The above factors, from the same equations, appear further as follows:

(1st) Production Quantity -

Wing	Horizontal	Vertical	Fuselage	Nacelles	Landing Gear
F362 4	F388 4	F411 4	F441 4	F453 4	F469 4
F362 5	F388 5	F411 5	F441 5	F453 5	F469 5

(2nd) Production Quantity -

Wing	Horizontal	Vertical	Fuselage	Nacelles	Landing Gear
F503 4	F530 4	F553 4	F582 4	F594 4	F609 4
F503 5	F530 5	F553 5	F582 5	F594 5	F609 5

MODEL CARD	DESCRIPTION	EQUATION NO.	REFERENCE
Nonrecurring Design and Development Costs			
F615 1-6	Scaling of engineering hours to weight, EE	(23)	Table 39
F616 7	Factor for configuration design engrg., F1	(25)	Table I-1
F617 8	Percentage factor, F2	(27)	-
F619 1-6	Scaling of tool mfg. hours to weight, ET	(28)	Page I-7
F620 7	Scaling of rate tooling to production rate, ER	(29)	-
F622 7	Ratio of basic tool engrg. to mfg., F3	(31)	Table I-2
F623 7	Percentage factor, rate tool engrg. to rate tool mfg., F4	(32)	-
F625 7	Percentage of total tool mfg. hours, F5	(34)	-
F626 8	Per labor factor for tooling material, F6	(36)	-
F627 8	Percentage of configuration design engrg dollars, F7	(37)	-
F628 7	Percentage of configuration design engrg hours, F8	(38)	-

MODEL CARD	DESCRIPTION	EQUATION NO.	REFERENCE
Nonrecurring Design and Development Costs (Cont)			
F628.8	Percentage of total tool mfg. hours, F9	(38)	
Recurring Airframe Production Costs (Summary) RDT&E Units			
F630.9	Multiplication by 10 to offset decimal placement in the next B-card above.		
F634.7	Factor for aggregating primary assembly and major mate, (MMPCTL)	(45)	–
F635.7	Q/C percentage of manufacturing hours, QCF	(44)	–
F637.8	Material factor for primary assembly and major mate	(45)	–
Procurement Articles (Qty 1)			
F640.9 thru F647.8	Same as RDT&E units		
Procurement Articles (Qty 2)			
F650.9 thru F657.8	Same as RDT&E units		

APPENDIX F

ESTIMATING COEFFICIENTS BACK-UP

This appendix consists of a set of charts containing the back-up data for the estimating coefficients used in estimating the first unit cost of detail fabrication and subassembly. They are also an integral part of the data base, providing an organization for data collection and retrieval. The collection, recording and analysis of additional data is expected to lead to revision to the estimating coefficients derived. Data were not available in every case but charts are included for future data collection.

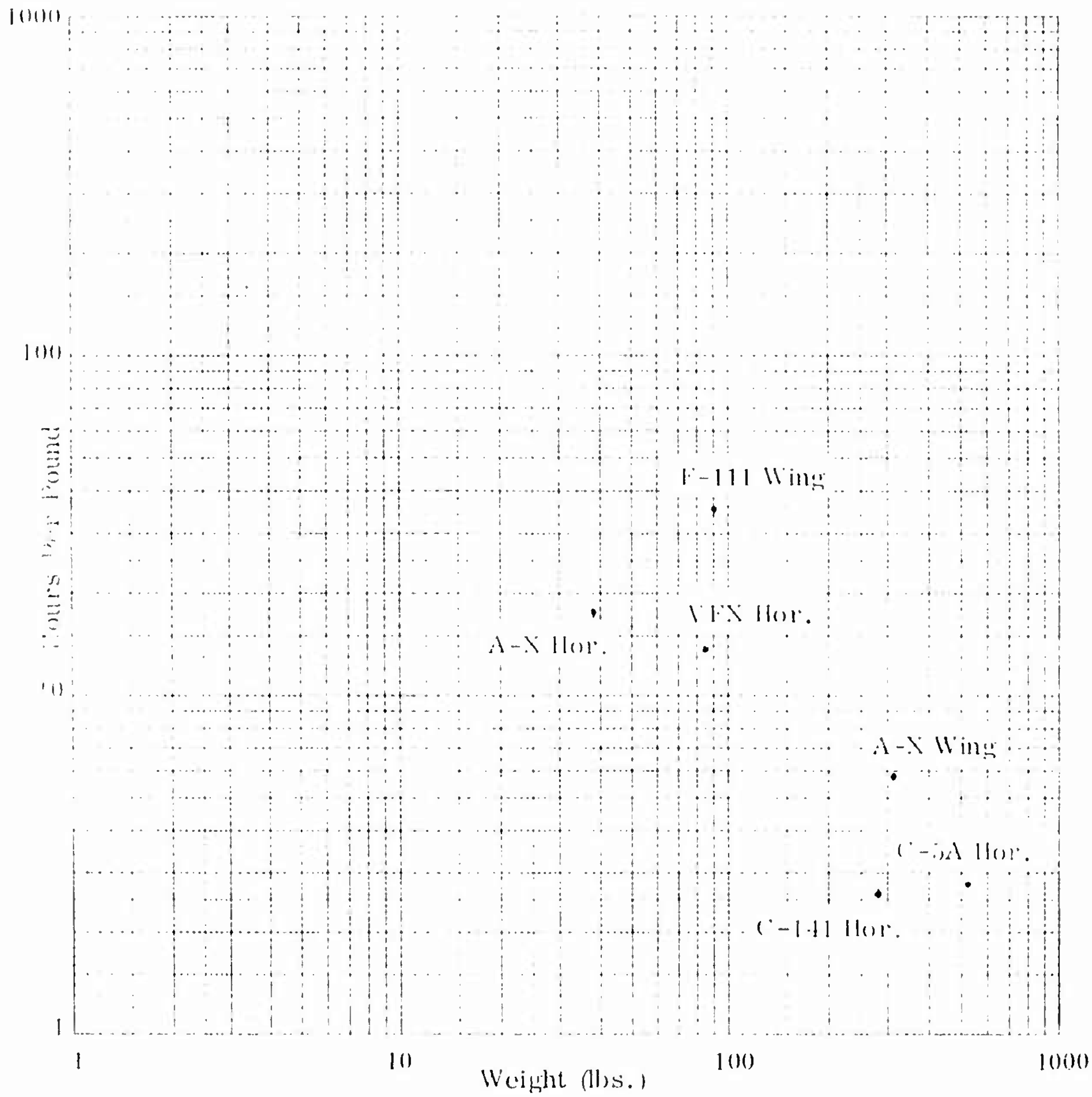

Figure F-1. Rib Detail Fabrication Hours Per Pound Against Weight.

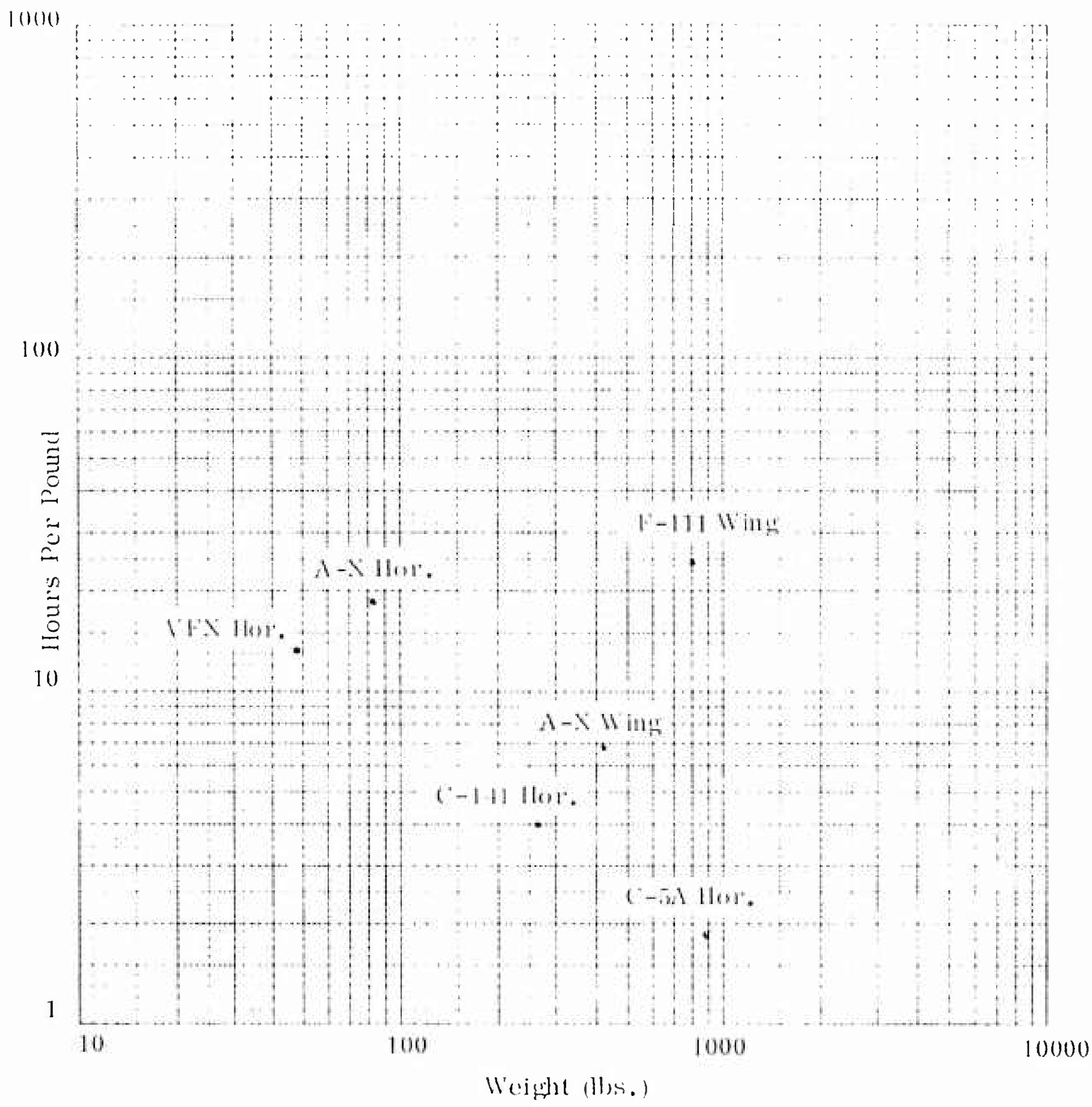

Figure F-2. Spar Detail Fabrication Hours Per Pound Against Weight.

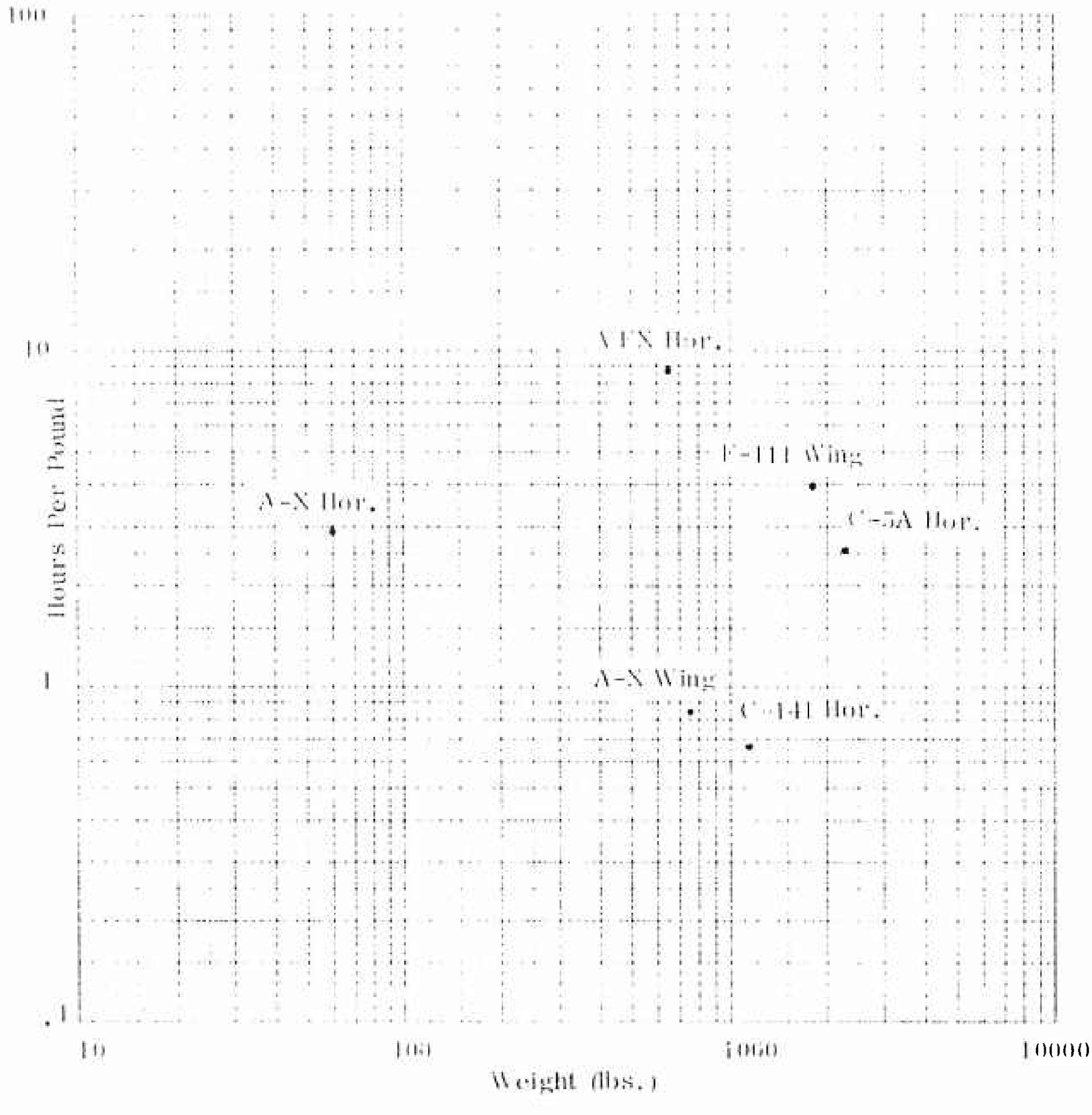

Figure F-3. Cover Detail Fabrication Hours Per Pound Against Weight.

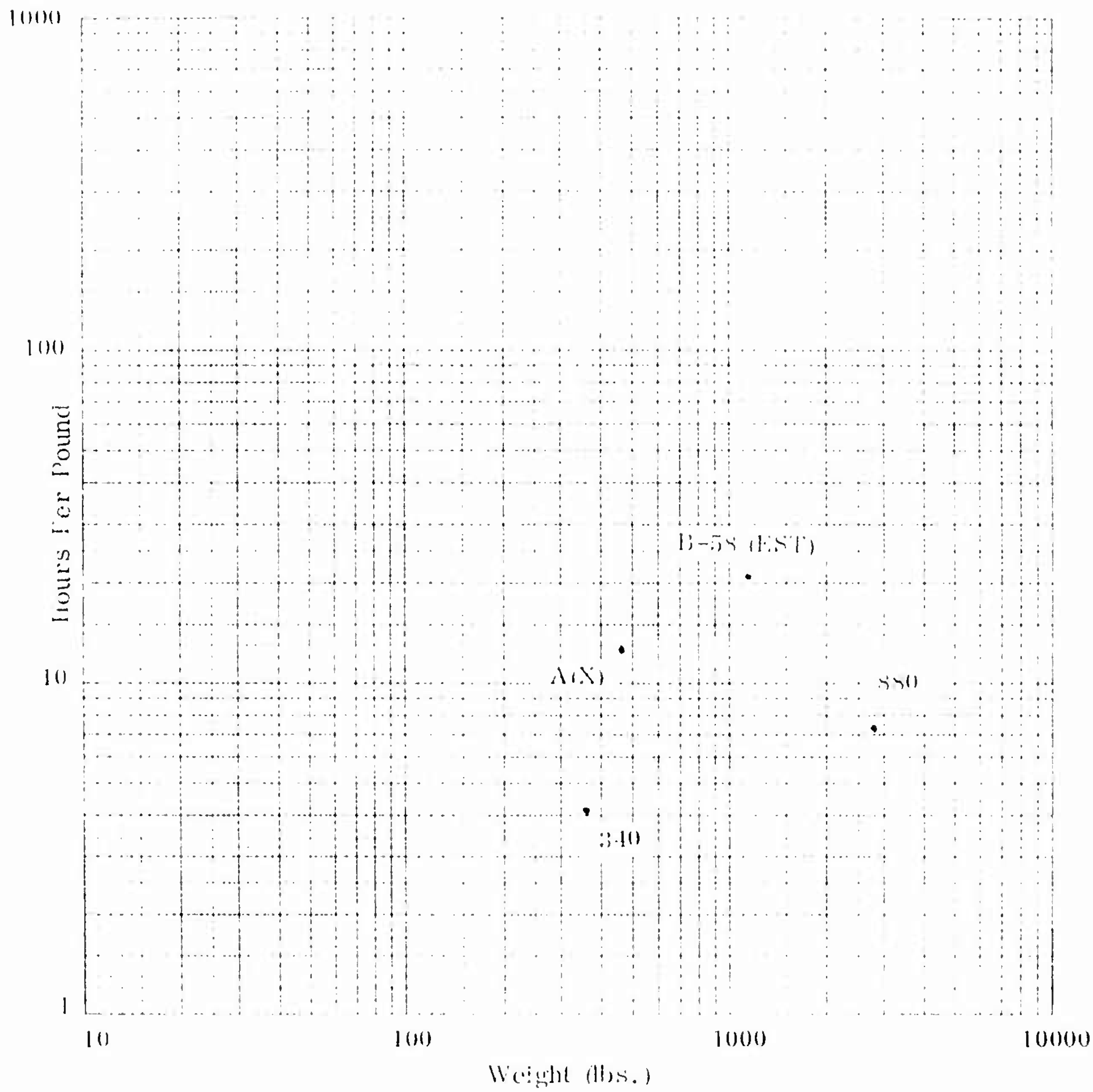

Figure F-4. Frame Detail Fabrication Hours Per Pound Against Weight.

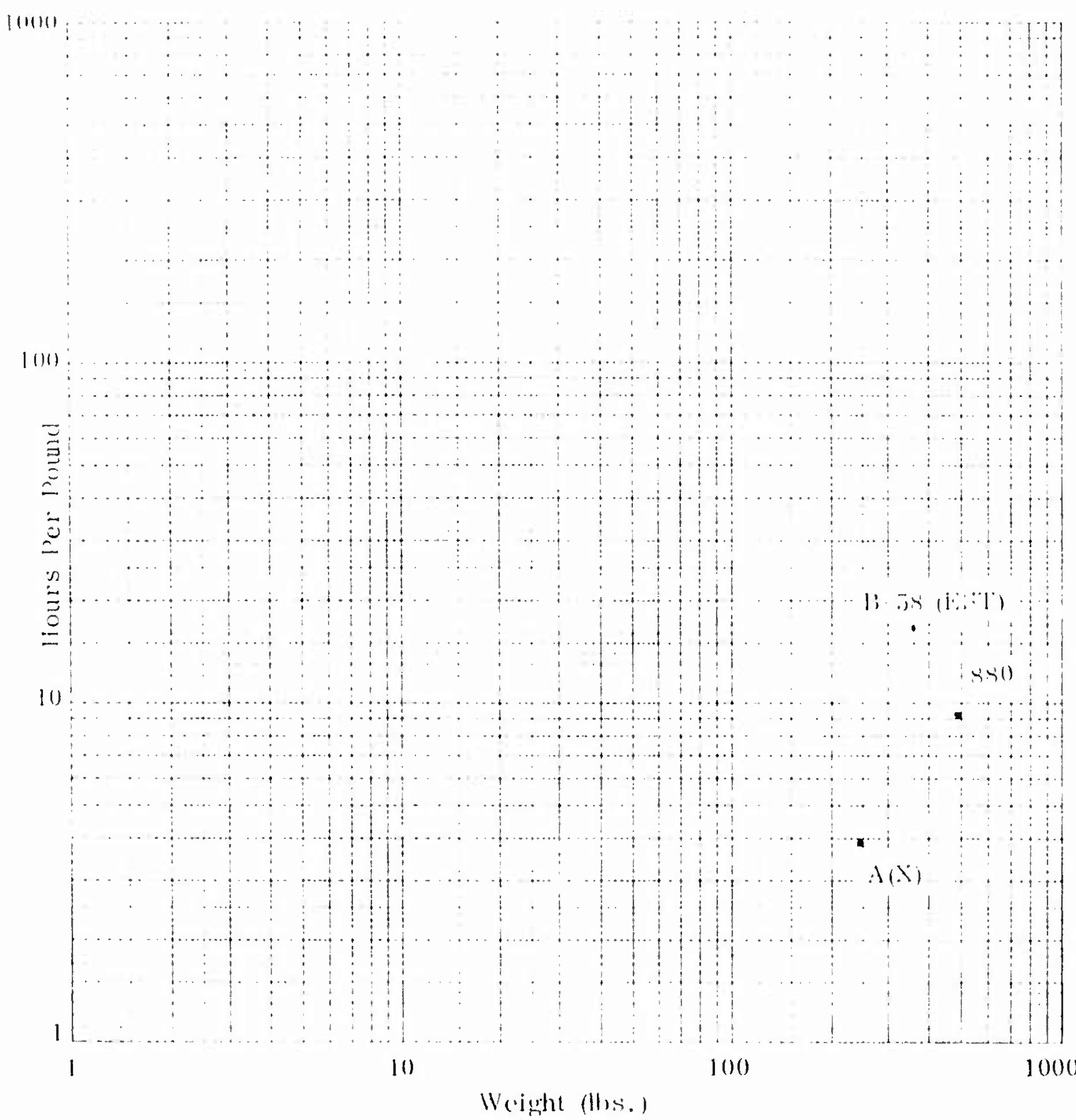

Figure F-5. Longeron Detail Fabrication Hours Per Pound Against Weight.

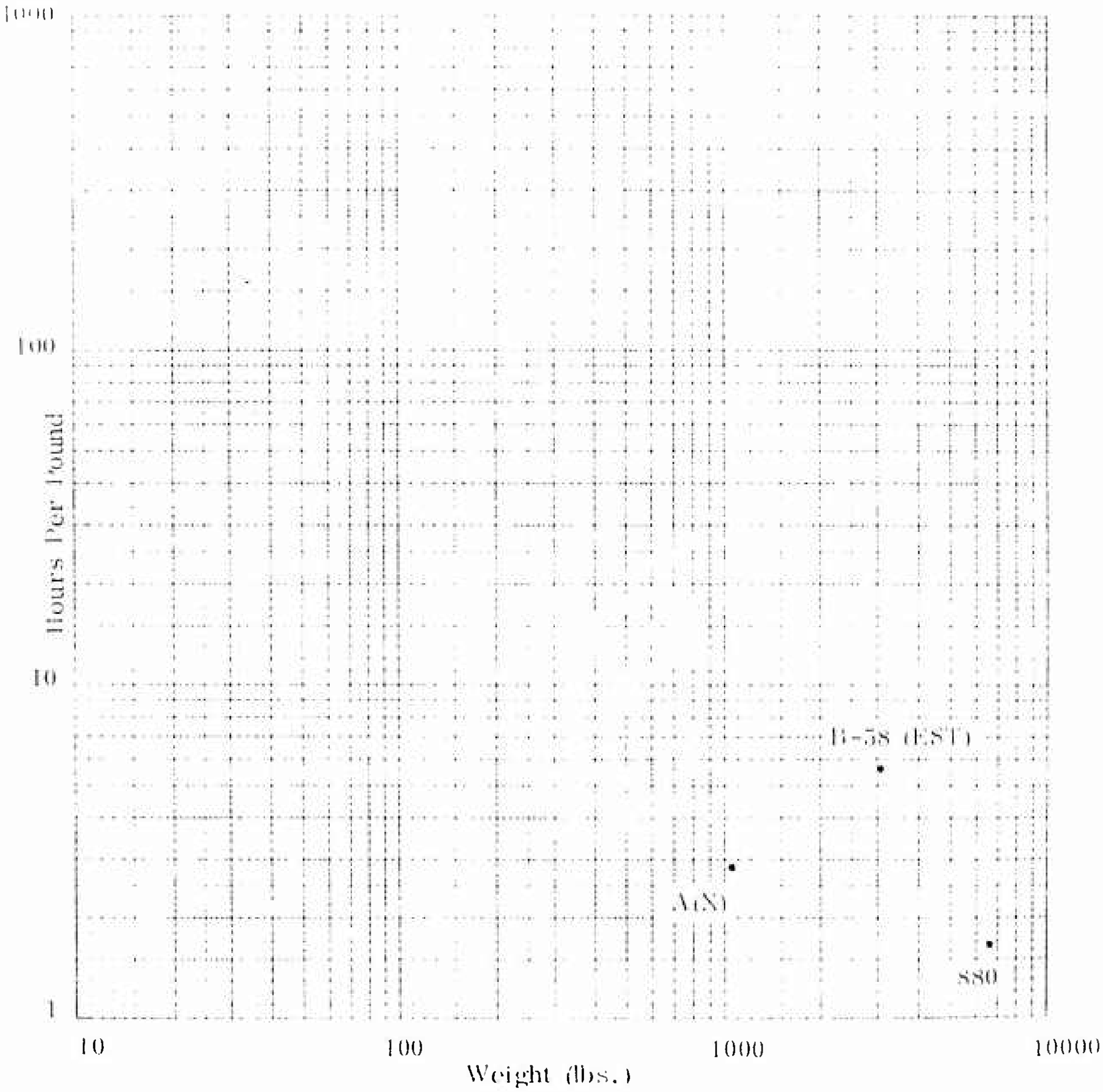

Figure F-6. Cover Detail Fabrication Hours Per Pound Against Weight.

Figure F-7. Rib Subassembly Hours Per Pound Against Weight.

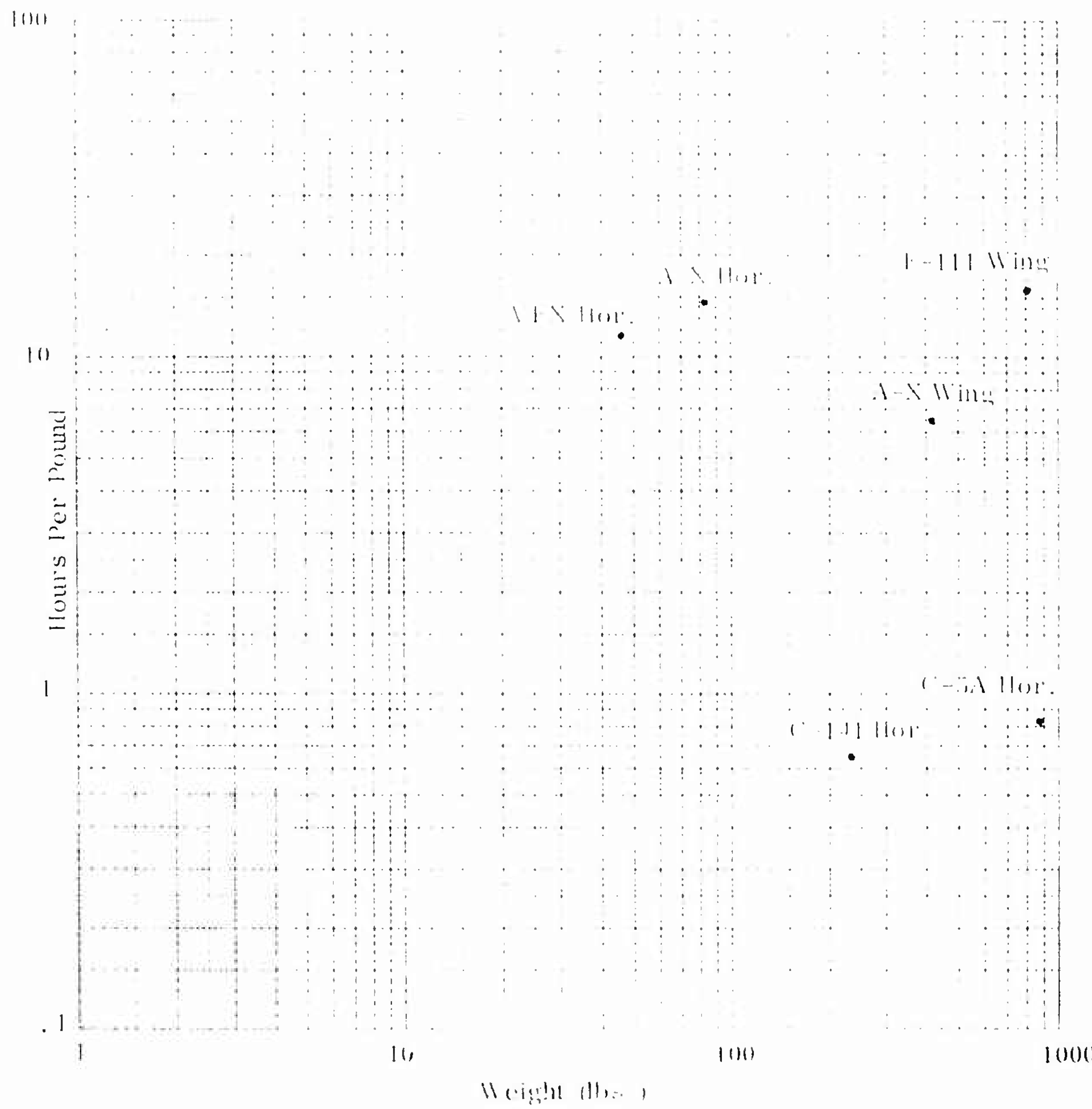

Figure F-8. Spar Subassembly Hours Per Pound Against Weight.

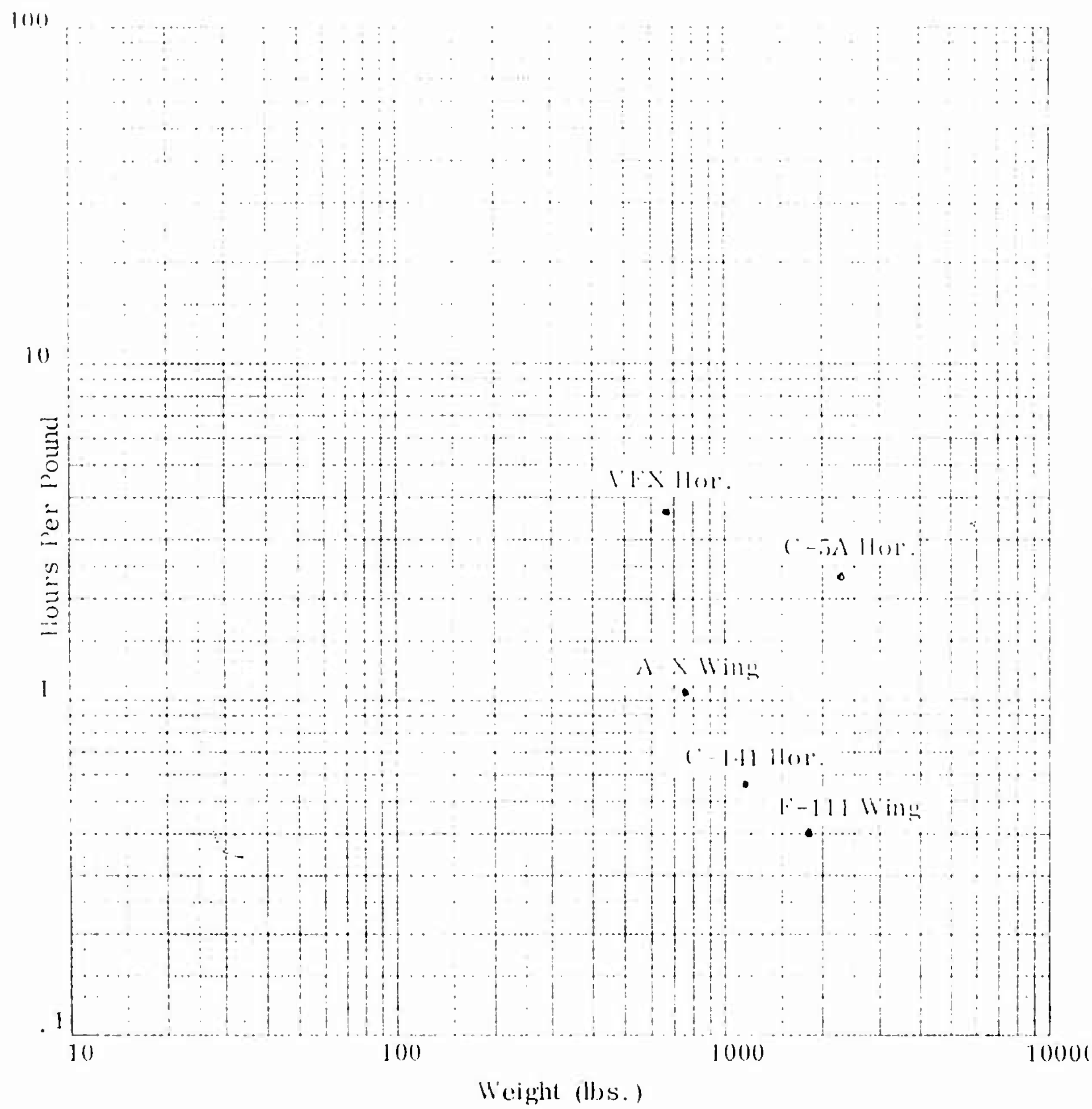

Figure F-9. Cover Subassembly Hours Per Pound Against Weight.

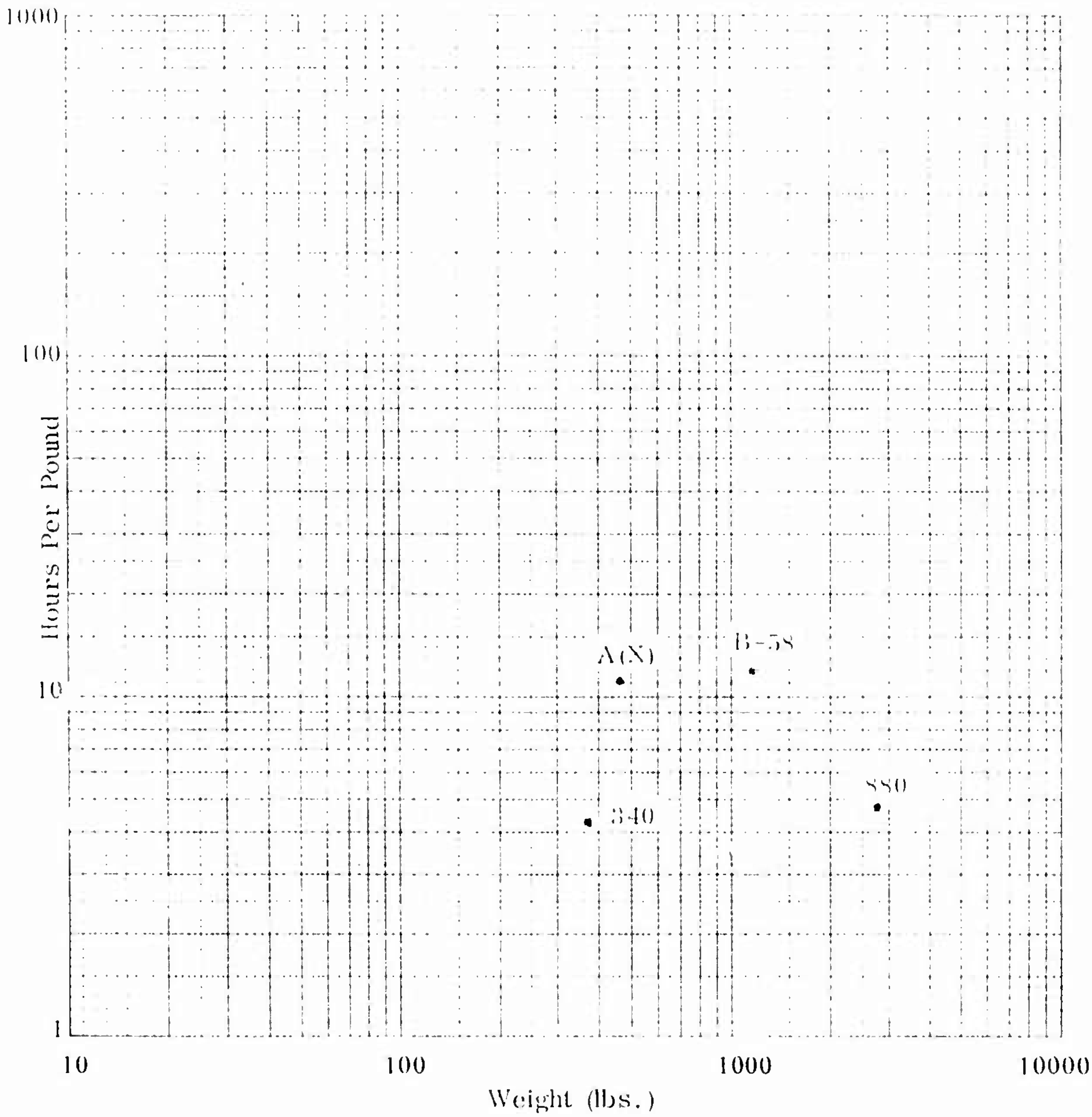

Figure F-10. Frames Subassembly Hours Per Pound Against Weight.

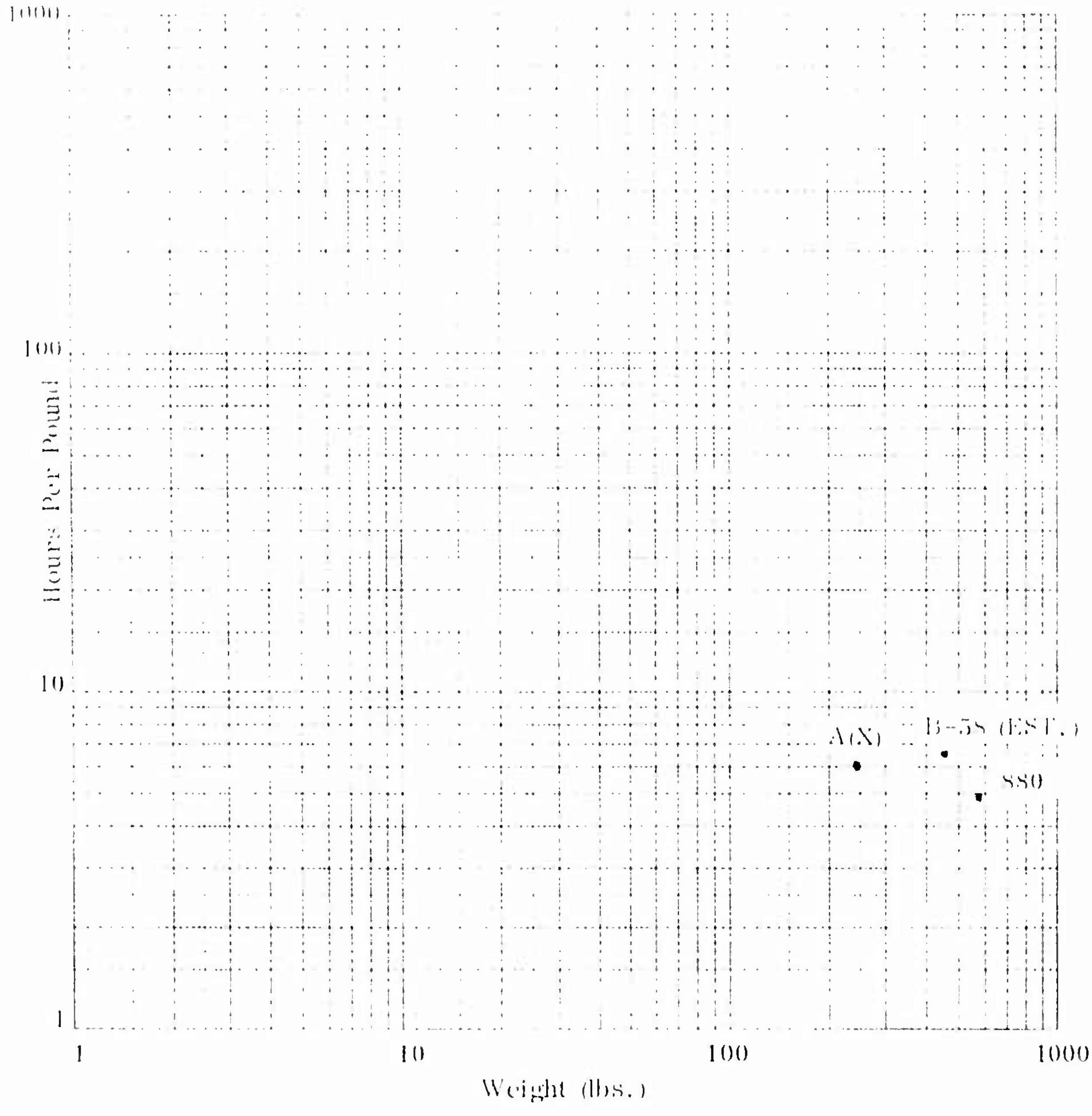

Figure F-11. Longeron Subassembly Hours Per Pound Against Weight.

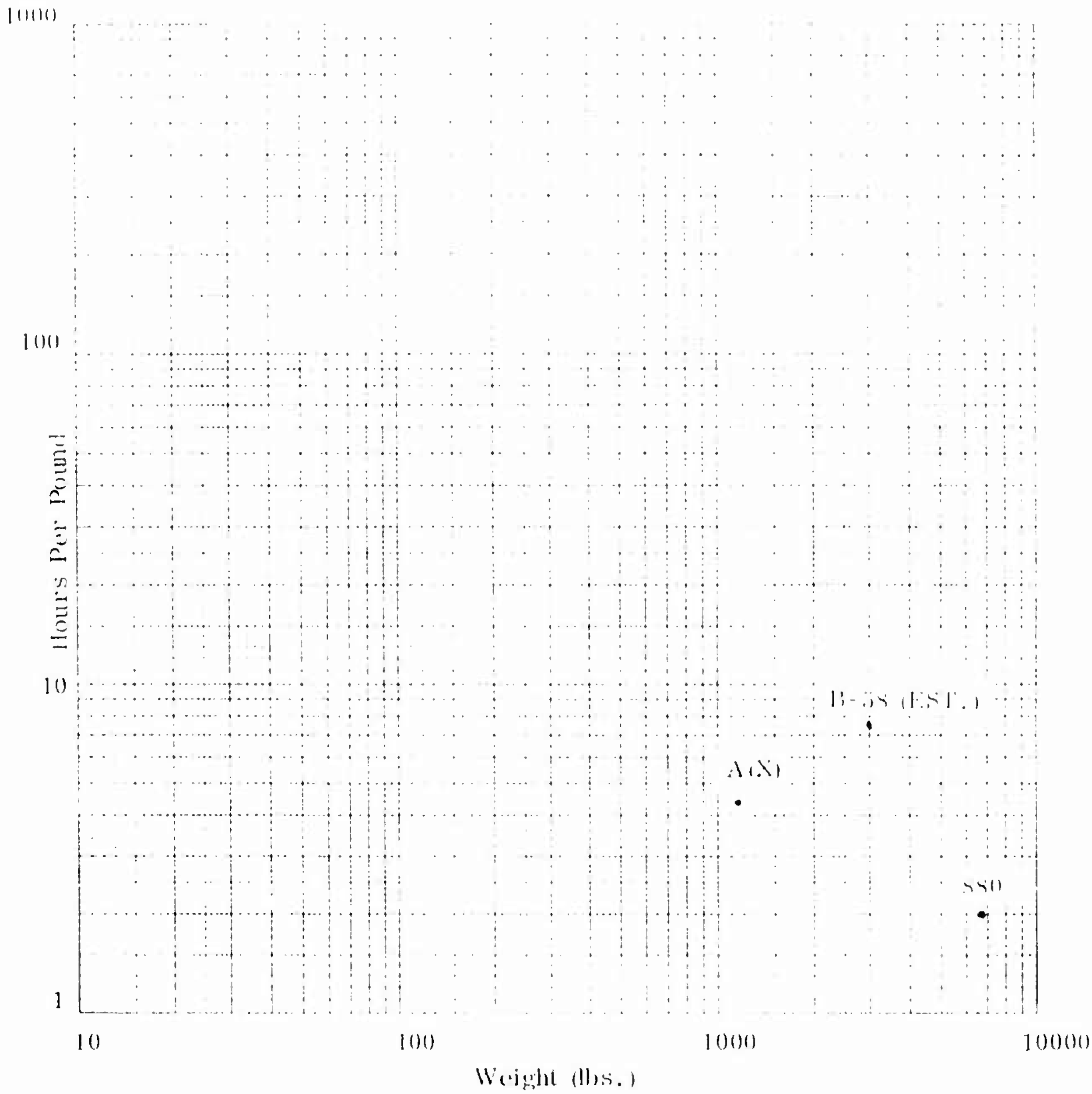

Figure F-12. Cover Subassembly Hours Per Pound Against Weight.

Factor	Aircraft Element					
	B-58					
	Wing	Horizontal	Vertical	Fuselage	Nacelle	Landing Gear
HSA1	0.2		.2	.2		
HSA2	2.0		2.0	2.0		
Q	.95		.95	.95		
R	.95		.95	.95		
WR	.95		.95	--		
RHP	--		--	20.	30.	20.

These data have been developed empirically based on verification at a higher level of detail. Data will be augmented as further test cases and data are developed.

Figure F-13. Structural Box and Basic Structure Major Assembly Factors.

Assembly Process		Aluminum Hour Foot	Ratio	Titanium Hour Foot	Ratio	Steel Hour Foot
Symbol	Nomenclature					
HT	Fitting and Trimming	.216	2.5	.540	2.0	.432
HL	Clamping and Layout	1.238	1.0	1.238	1.0	1.238
HD	Drilling (Hand)	.557	4.19	2.335	2.0	1.114
HE	Hole Finishing	.810	4.19	3.395	2.0	1.620
HFI	Fastener Installation	.972	1.75	1.703	1.75	1.703
HEI	Assembly Perimeter	2.48	2.5	6.2	2.0	4.96
HS	Finish Paint	.07 Hr./ Sq. Ft.	1.0	.07 Hr. Sq. Ft.	1.0	.07 Hr. Sq. Ft.

HT, HL, HD, HE, HFI, and HEI values include a 1.6 factor for working access around Major Assembly Fixtures and a 18.0 factor for first unit effect.

Figure F-14. Major Assembly Factors.

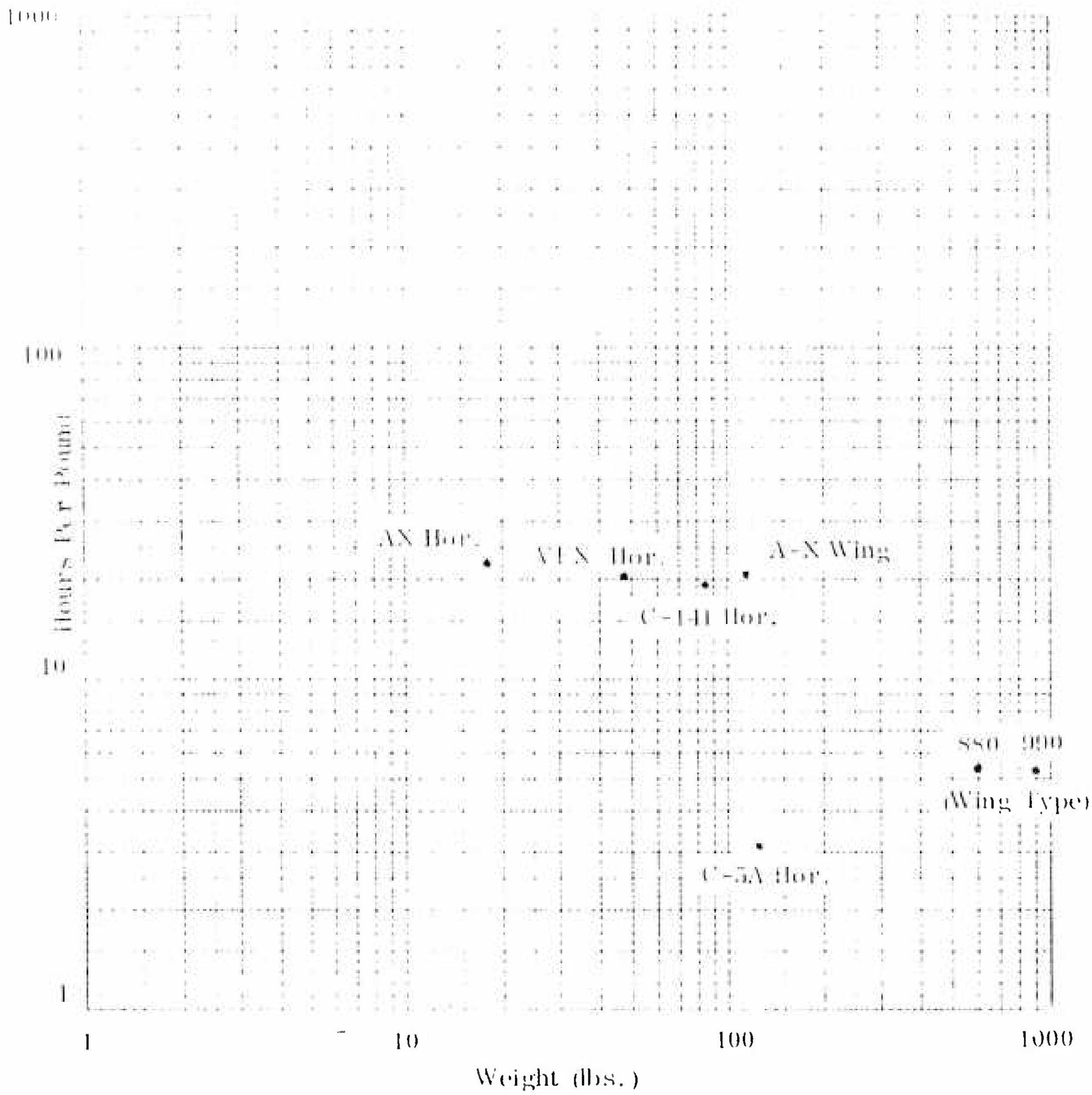

Figure F-15. Leading Edge Detail Fabrication
Hours Per Pound Against Weight.

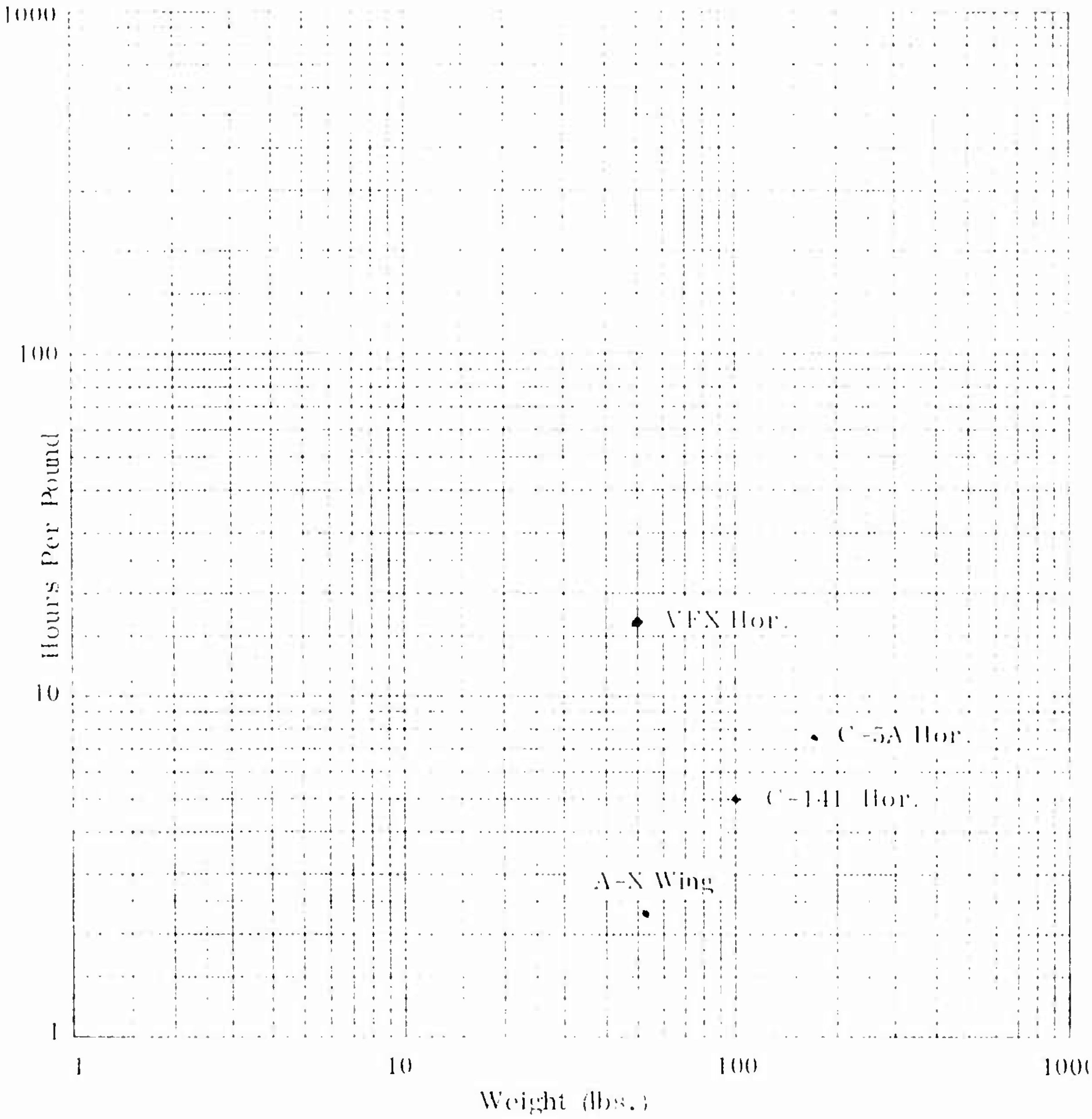

Figure F-16. Trailing Edge Detail Fabrication
Hours Per Pound Against Weight.

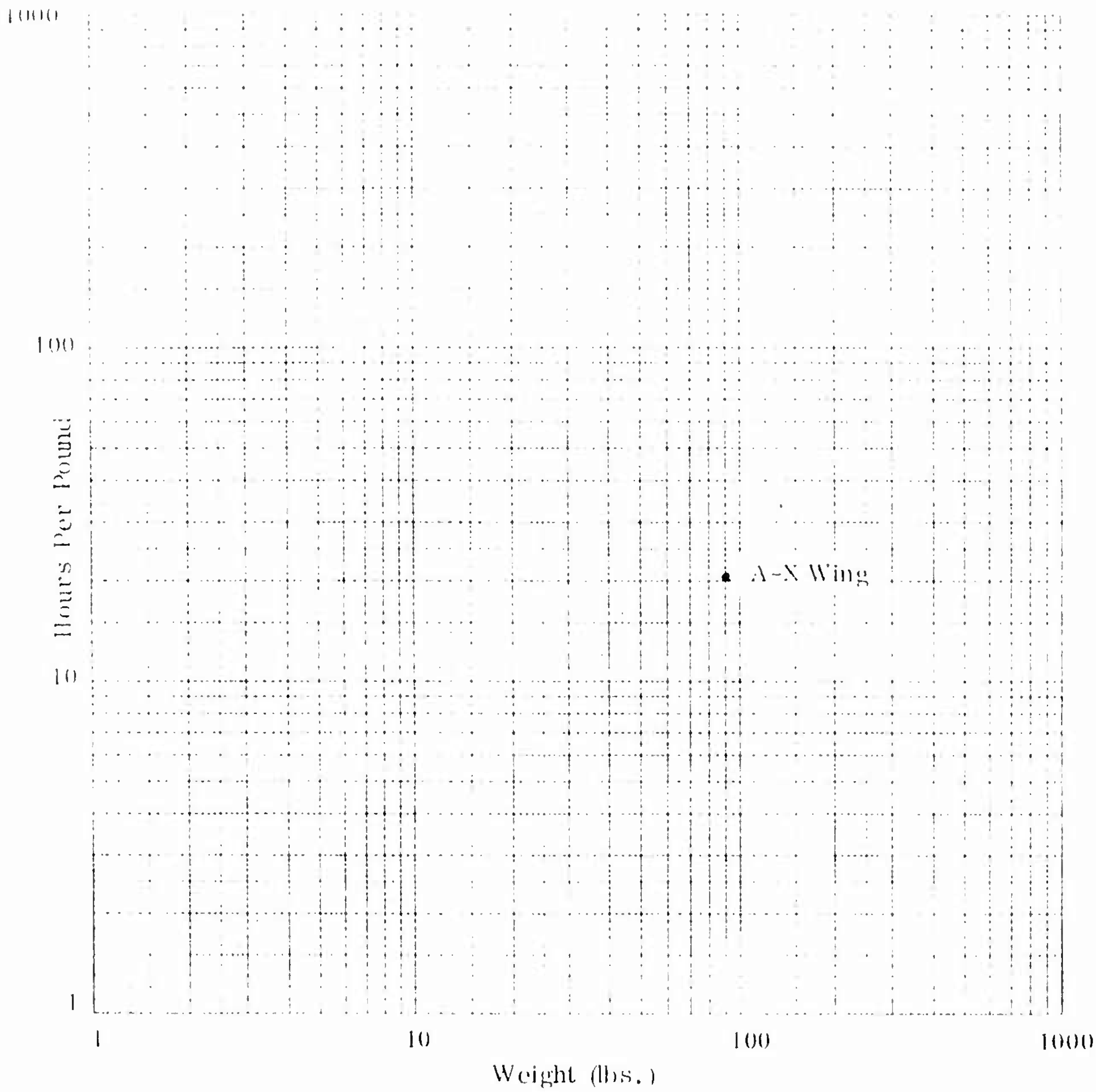

Figure F-17. Aileron Detail Fabrication
Hours Per Pound Against Weight.

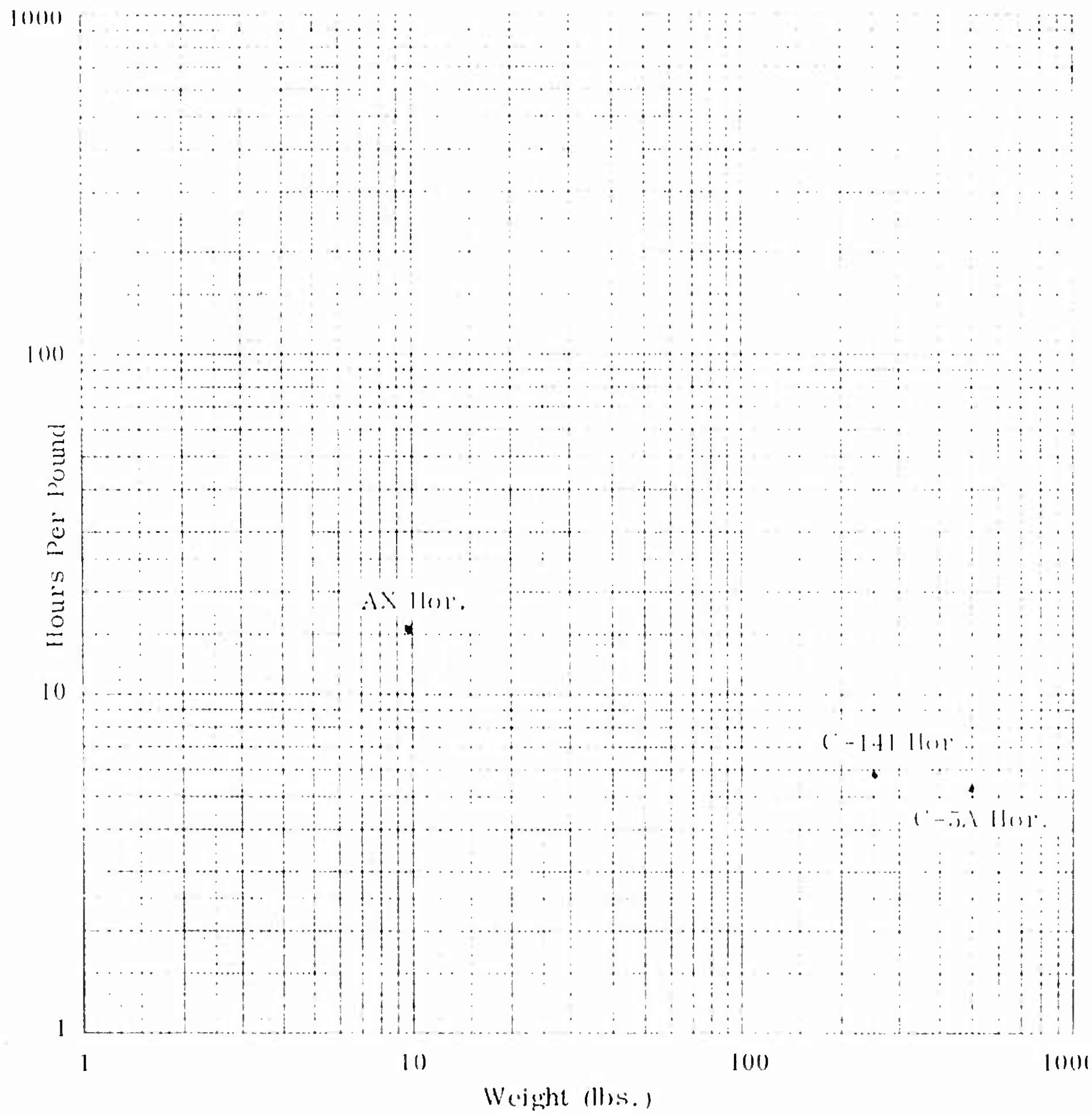

Figure F-18. Fairing Detail Fabrication Hours Per Pound Against Weight.

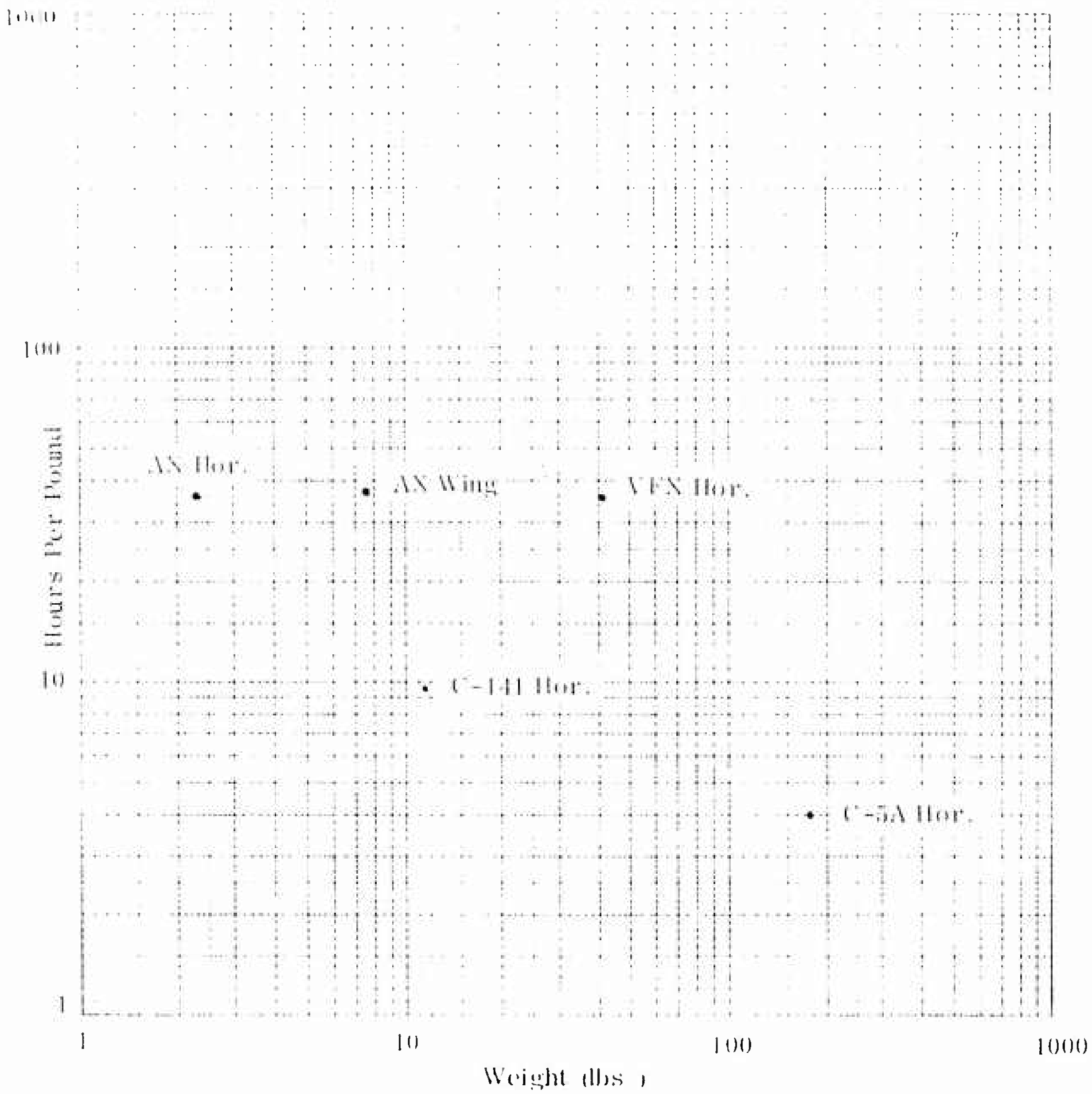

Figure F-19. Tip Detail Fabrication Hours Per Pound Against Weight.

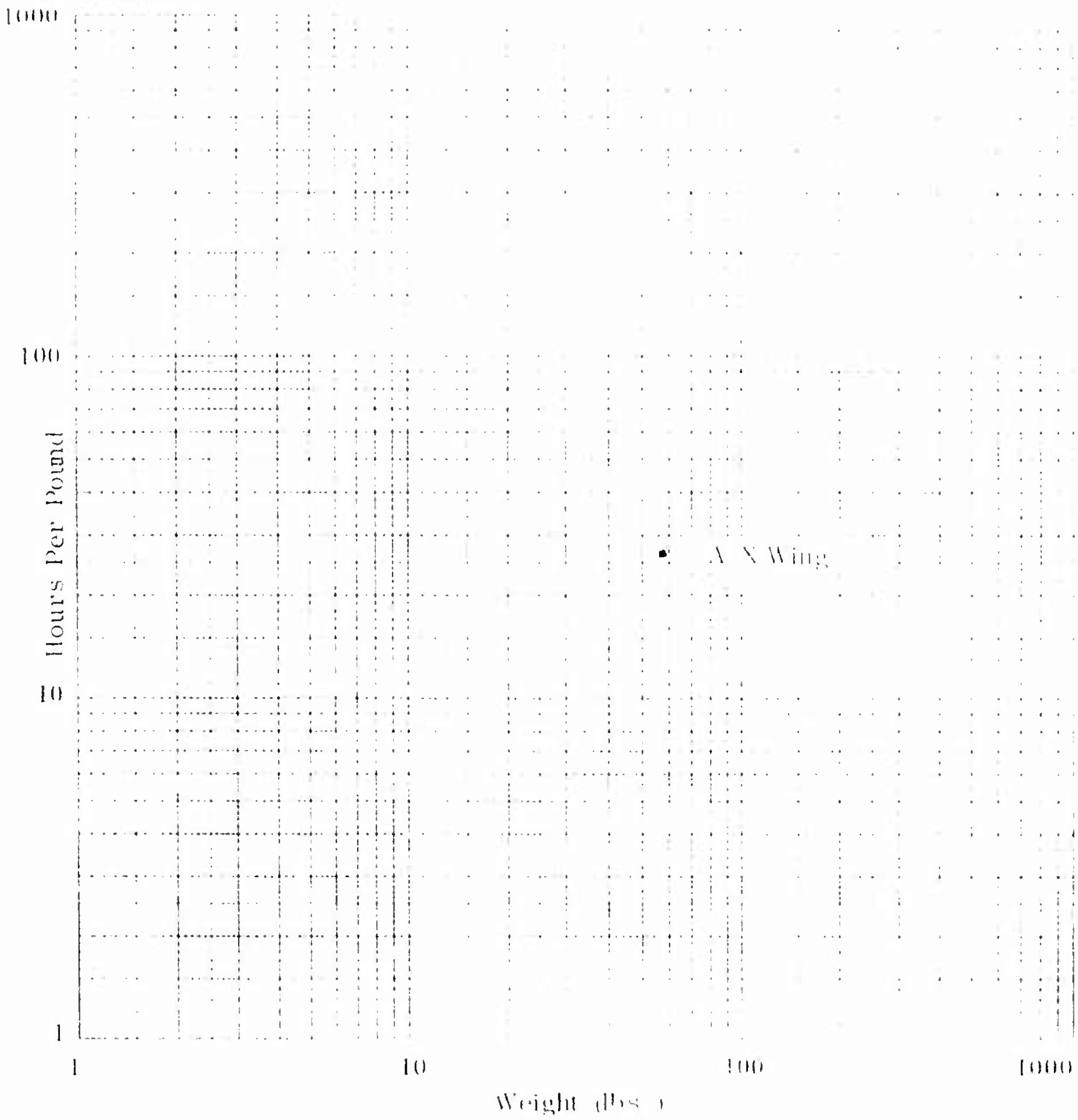

Figure F-20. Spoiler Detail Fabrication Hours Per Pound Against Weight.

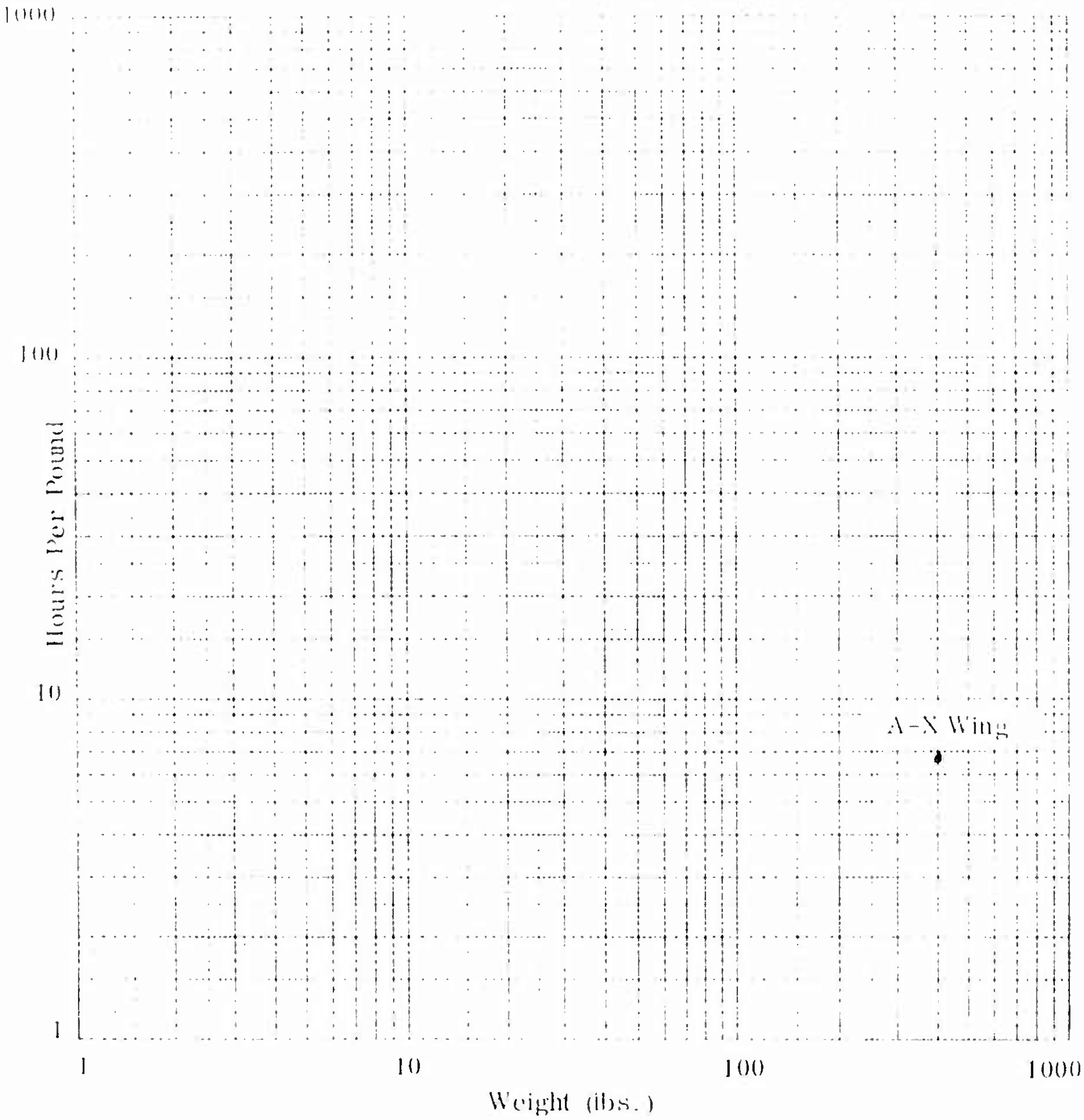

Figure F-21. Flap Detail Fabrication Hours Per Pound Against Weight

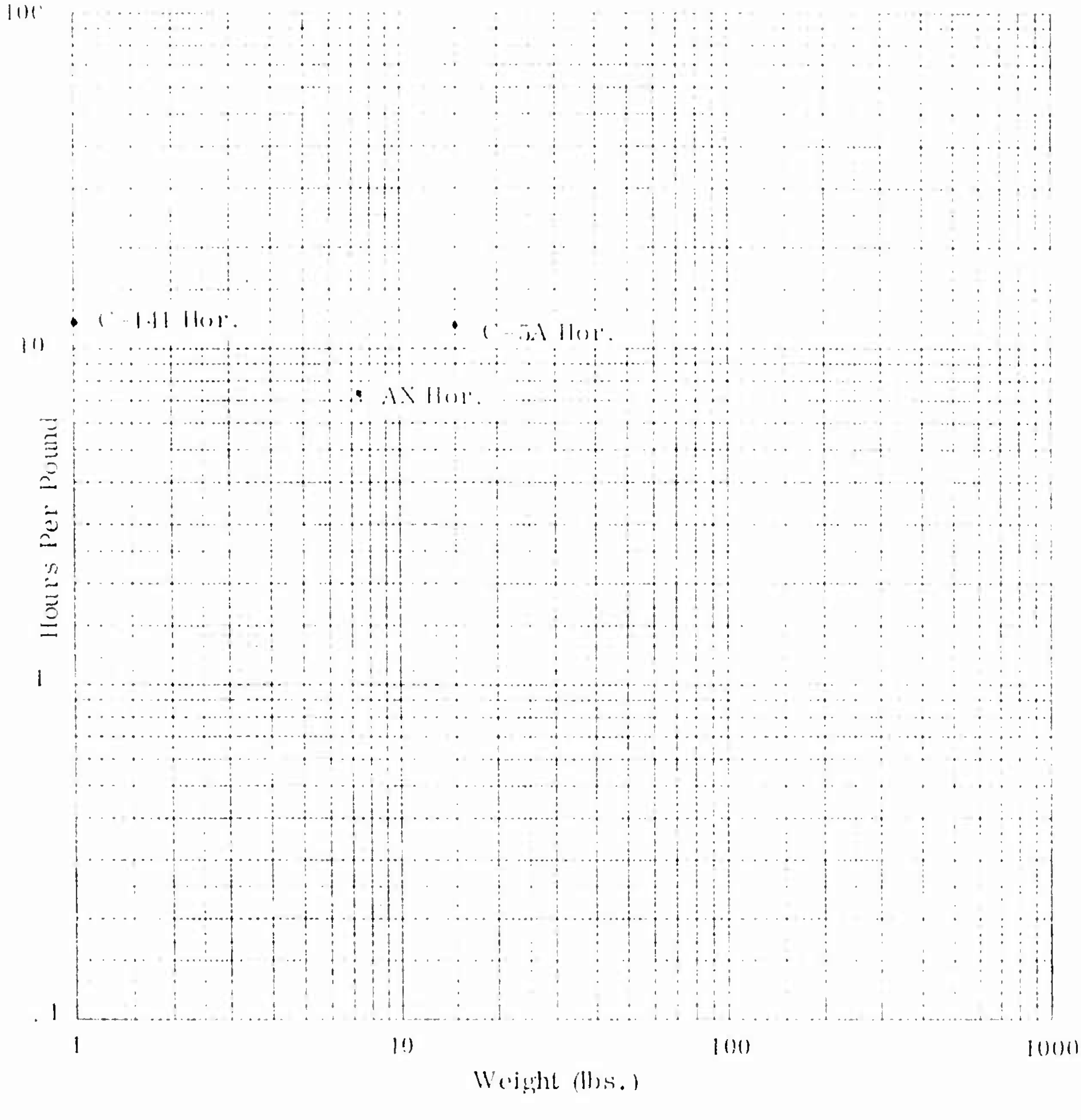

Figure F-22. Attachment Structure Detail Fabrication Hours Per Pound Against Weight.

Figure I-23. Access Doors Detail Fabrication Hours Per Pound Against Weight.

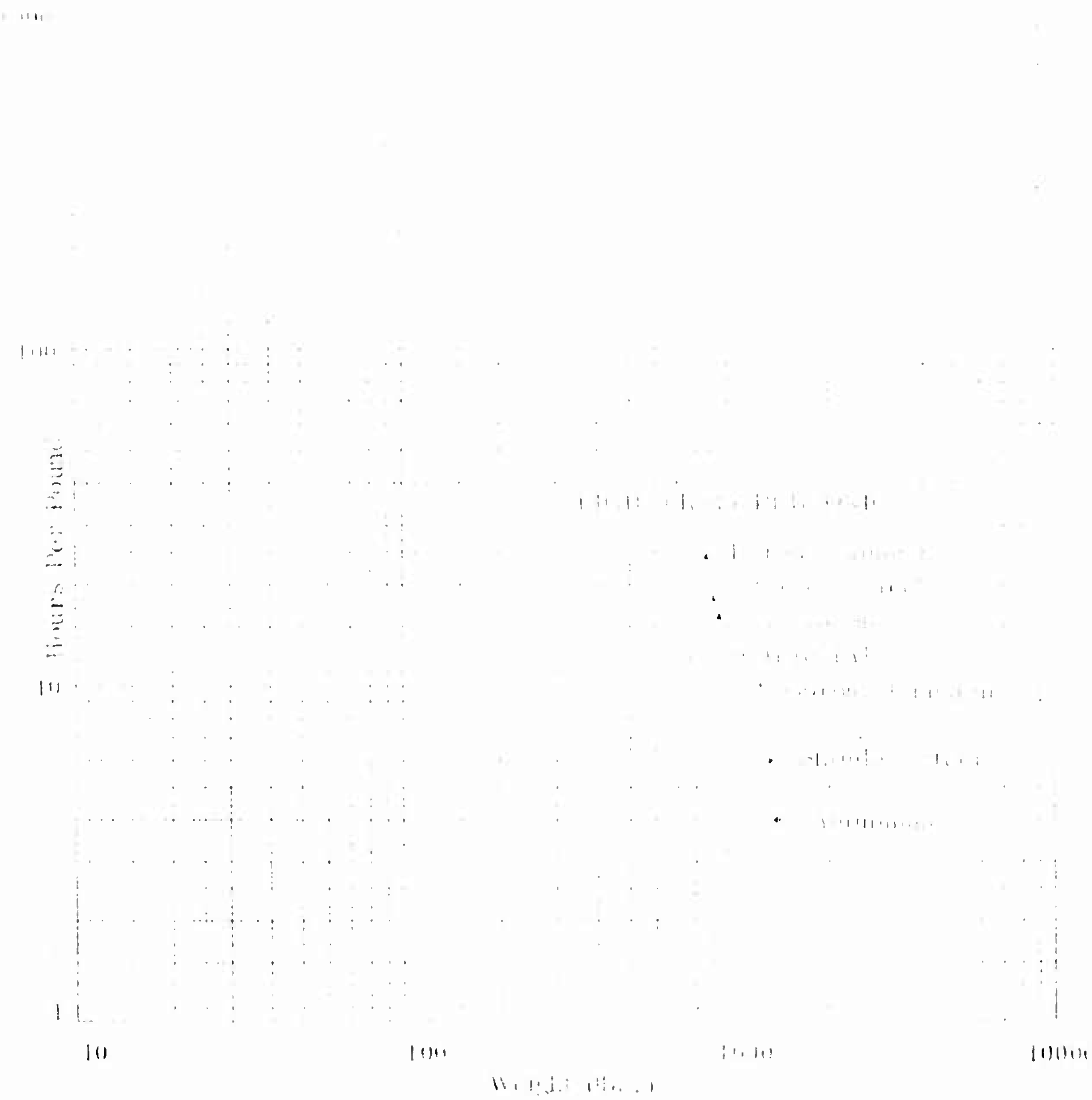

Figure F-24. Wing Mounted Air Induction Detail Fabrication Hours Per Pound Against Weight

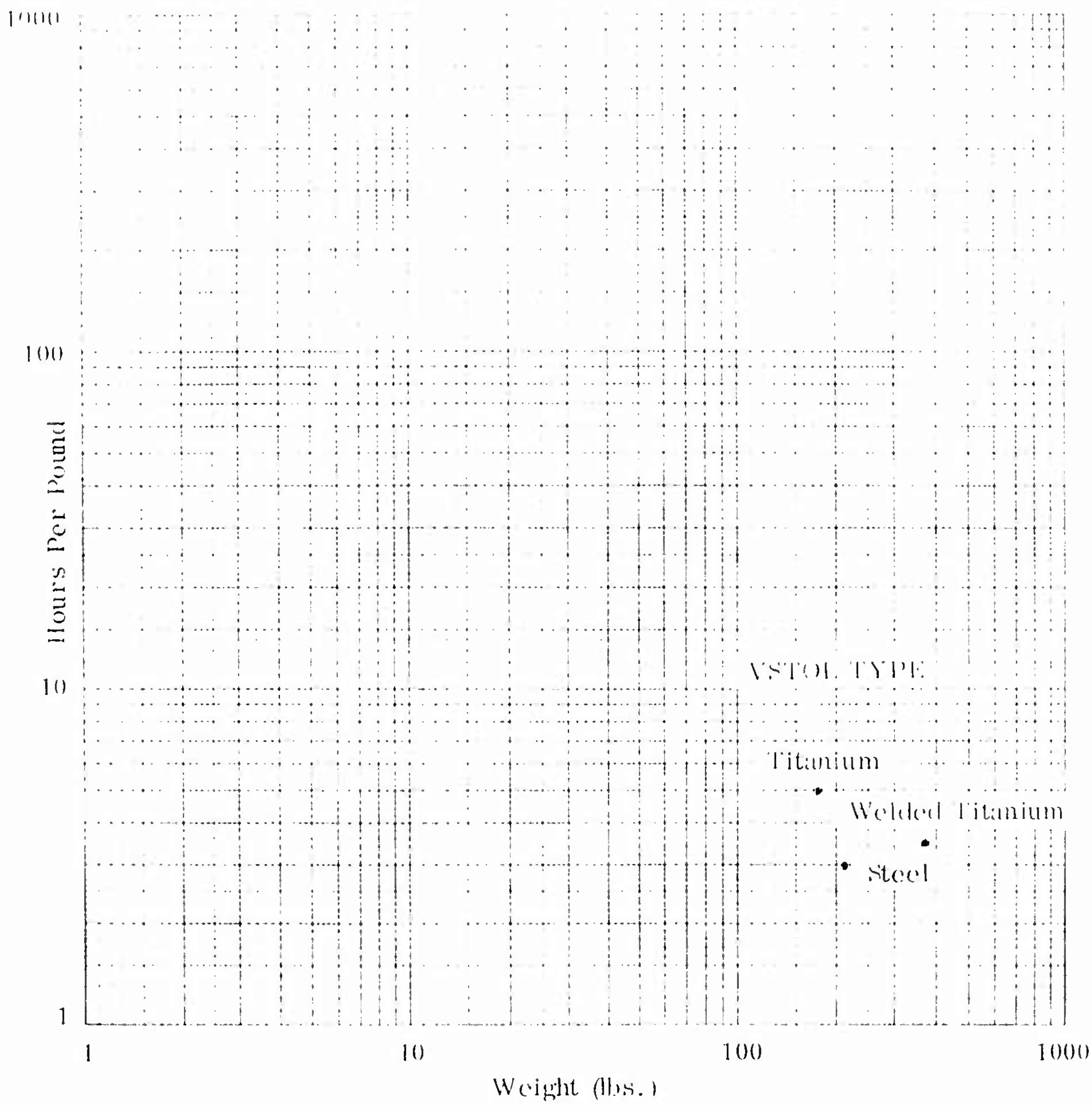

Figure F-25. High Lift Ducting Detail Fabrication Hours Per Pound Against Weight.

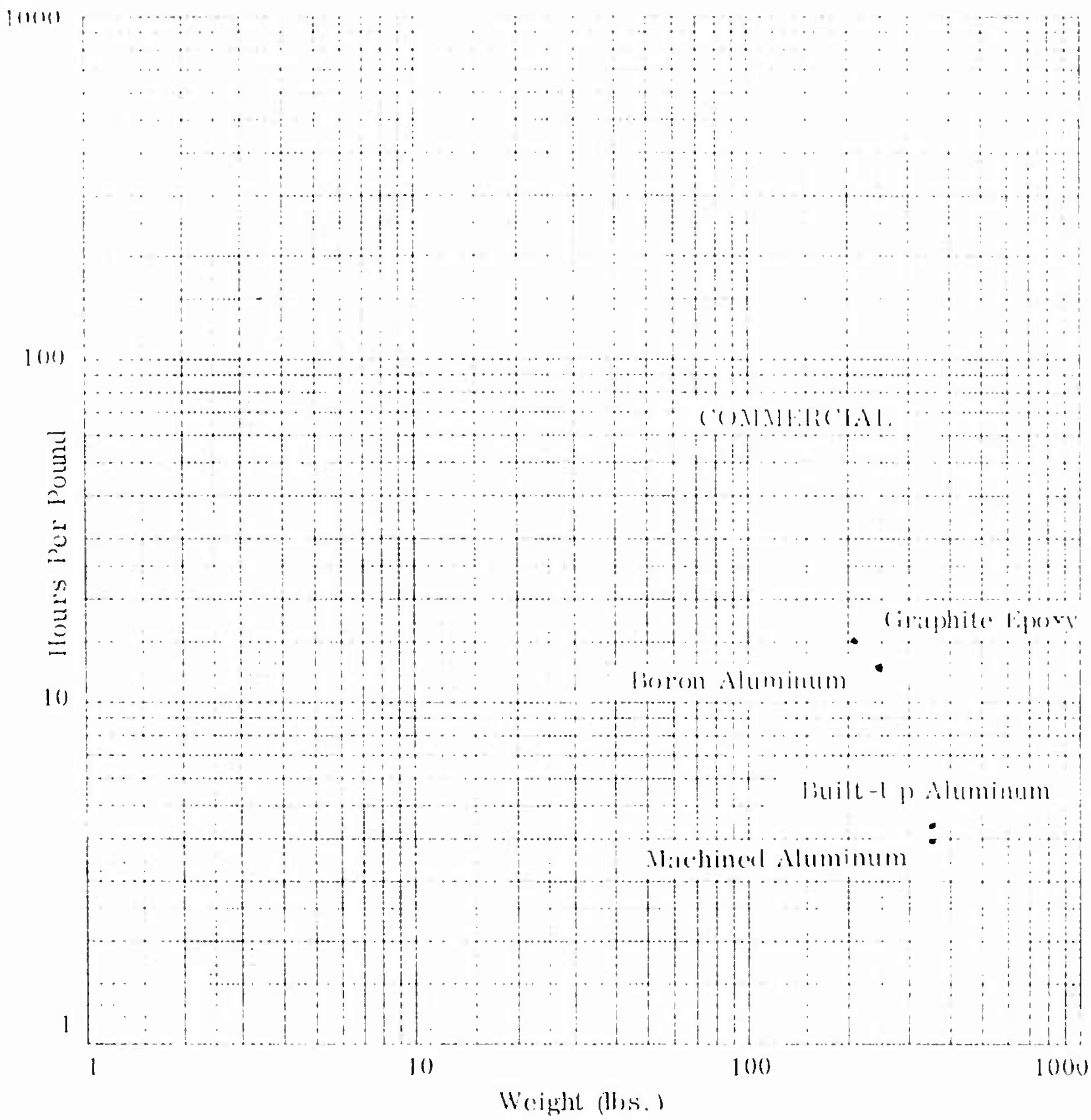

Figure F-26. Slats Detail Fabrication Hours Per Pound Against Weight.

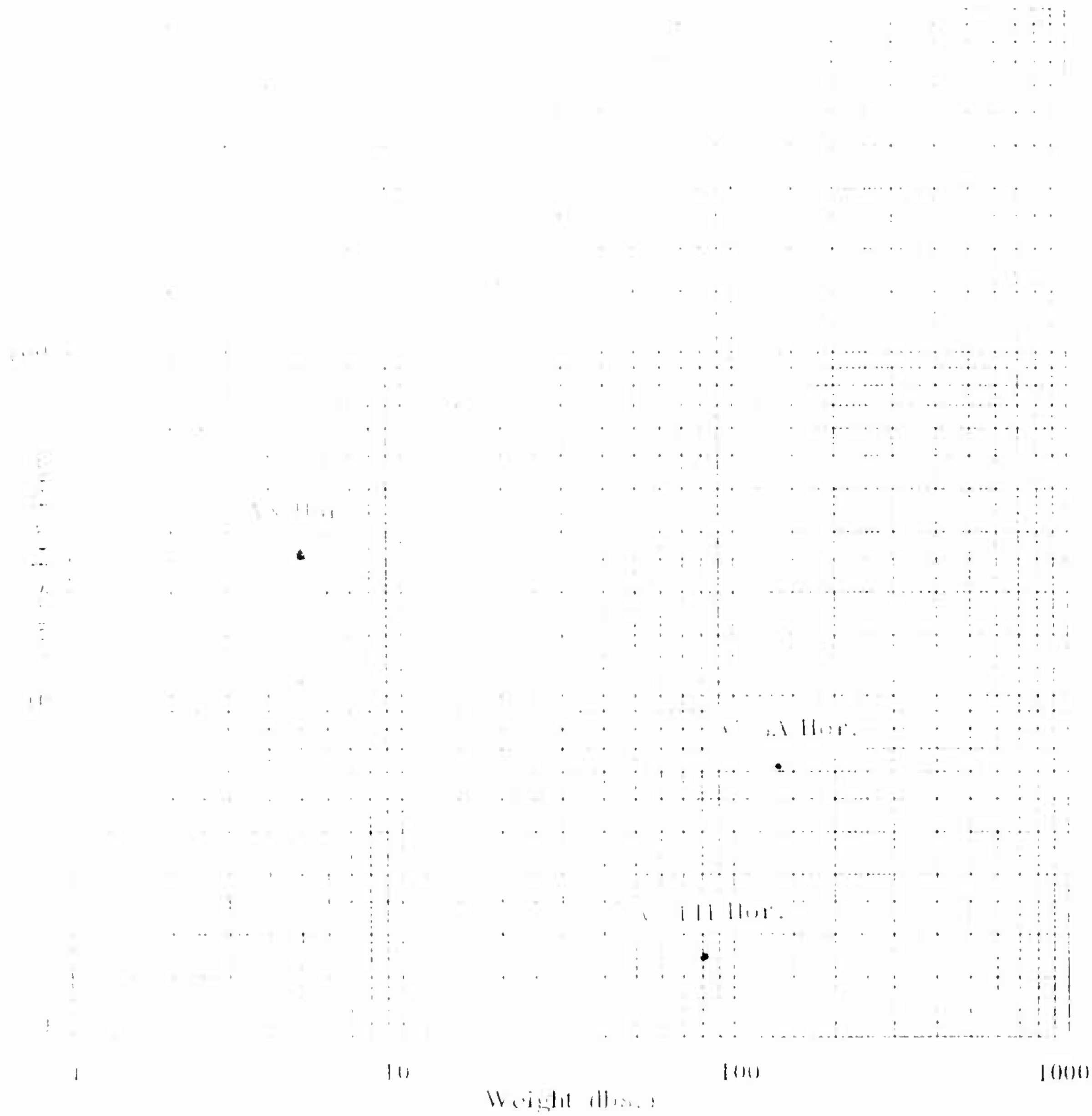

Figure F-27. Hinges, Brackets and Seals Detail
Fabrication Hours Per Pound
Against Weight.

Figure F-28. Pivots and Folds Detail Fabrication
Hours Per Pound Against Weight.

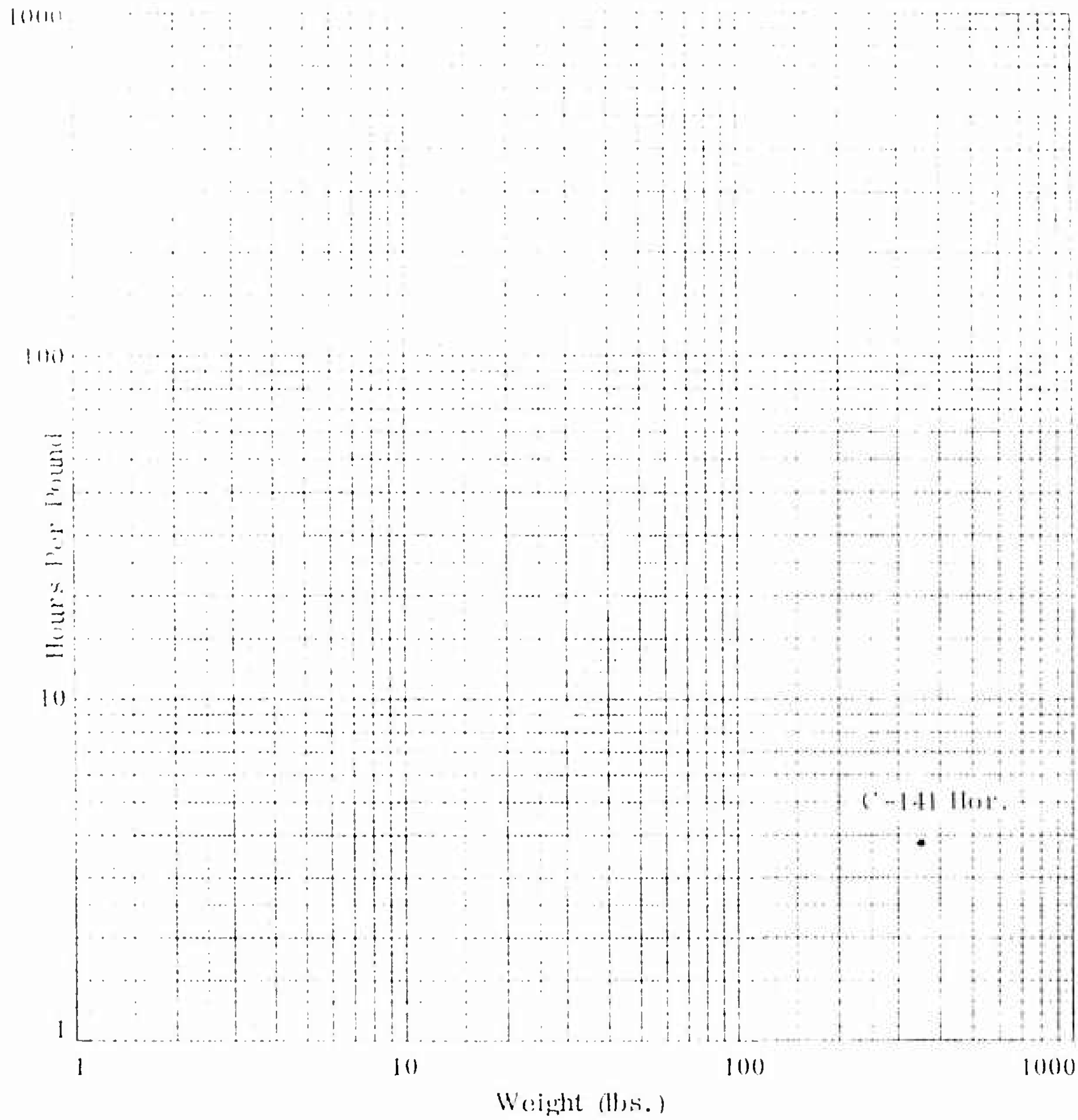

Figure F-29. Center Section Detail Fabrication
Hours Per Pound Against Weight.

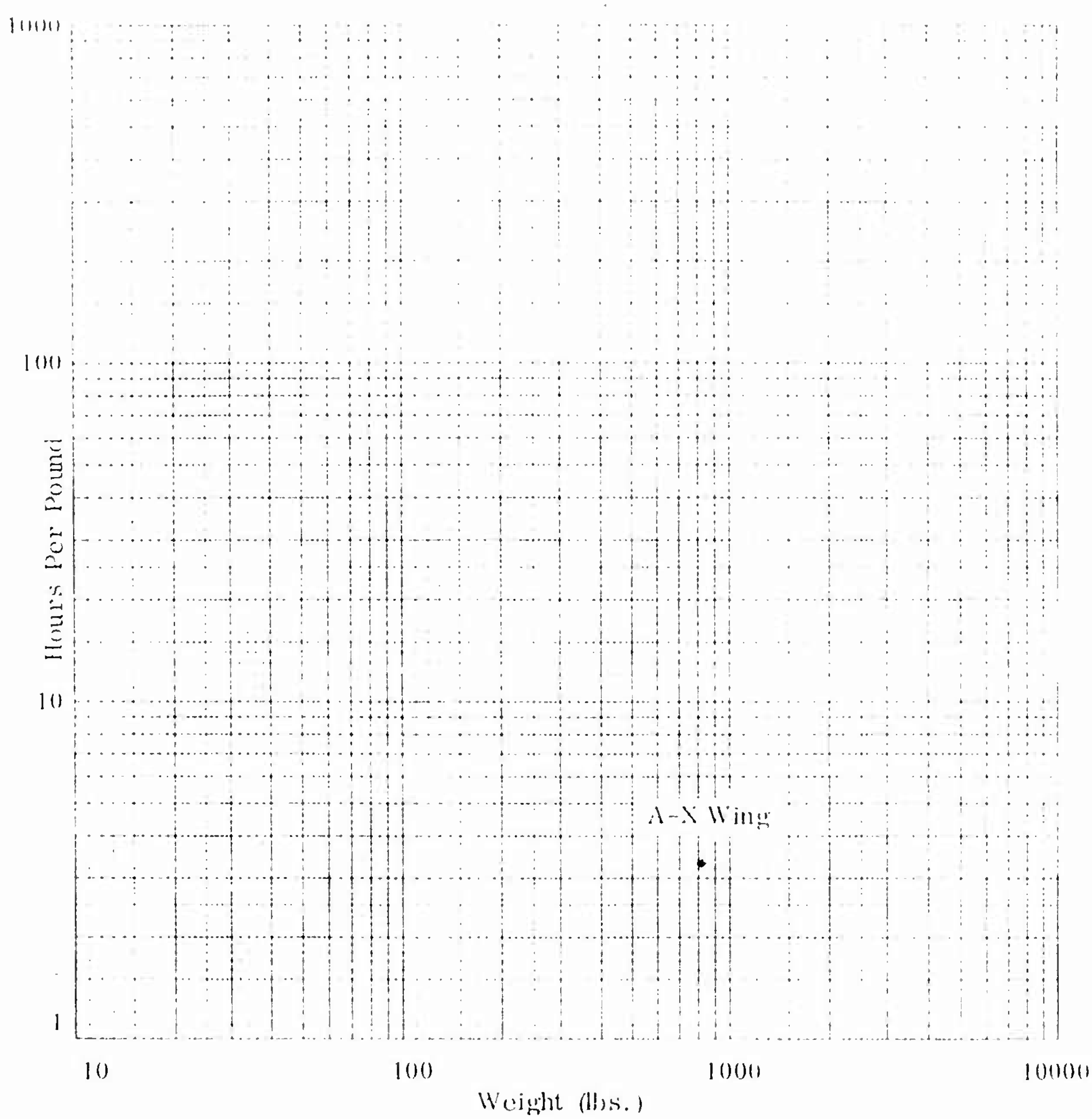

Figure F-30. Detail Fabrication Hours Per Pound Against Weight for Miscellaneous Assemblies.

Figure F-31. Elevator Detail Fabrication
Hours Per Pound Against Weight.

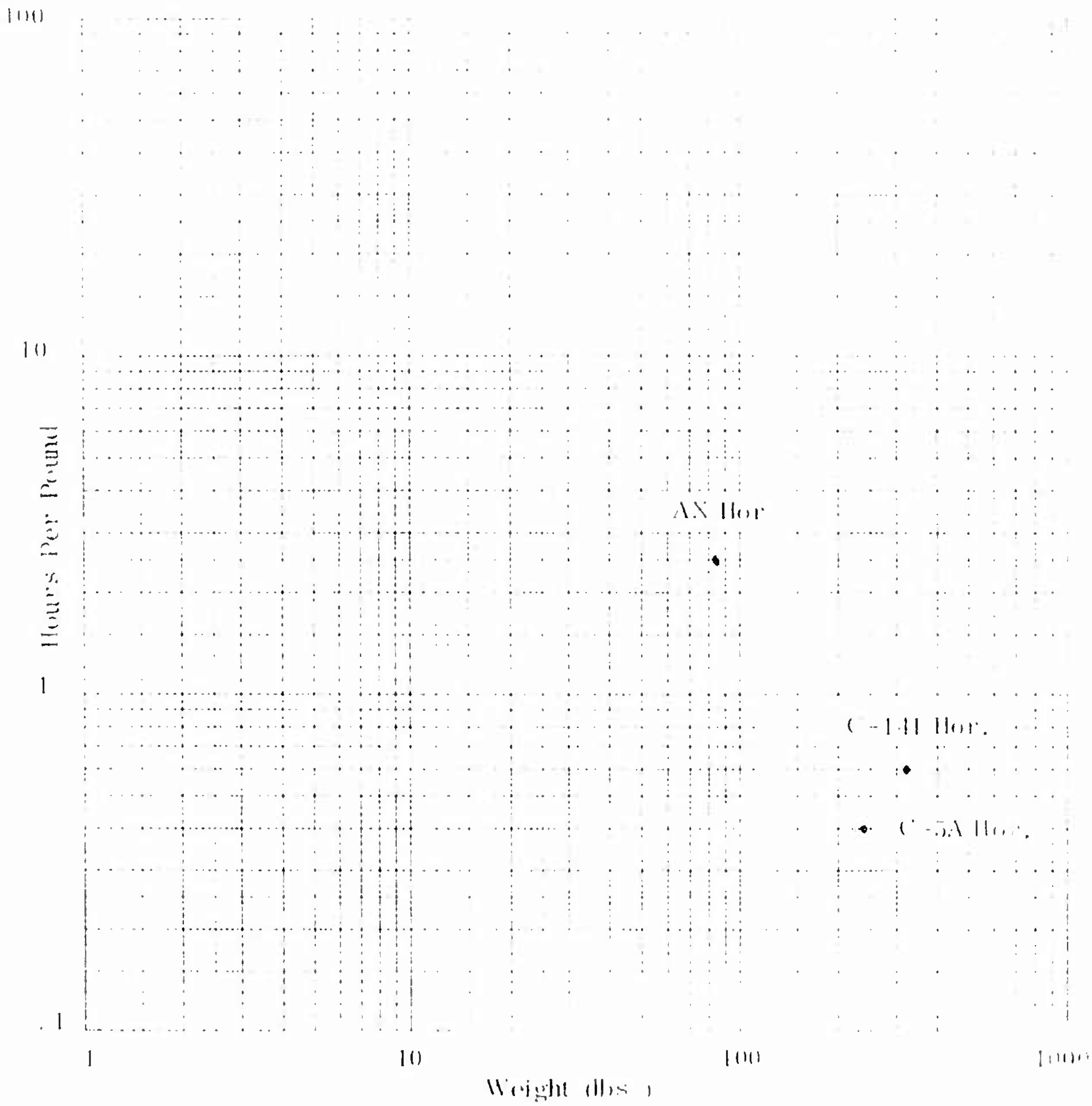

Figure F-32. Balance Weights Detail Fabrication
Hours Per Pound Against Weight.

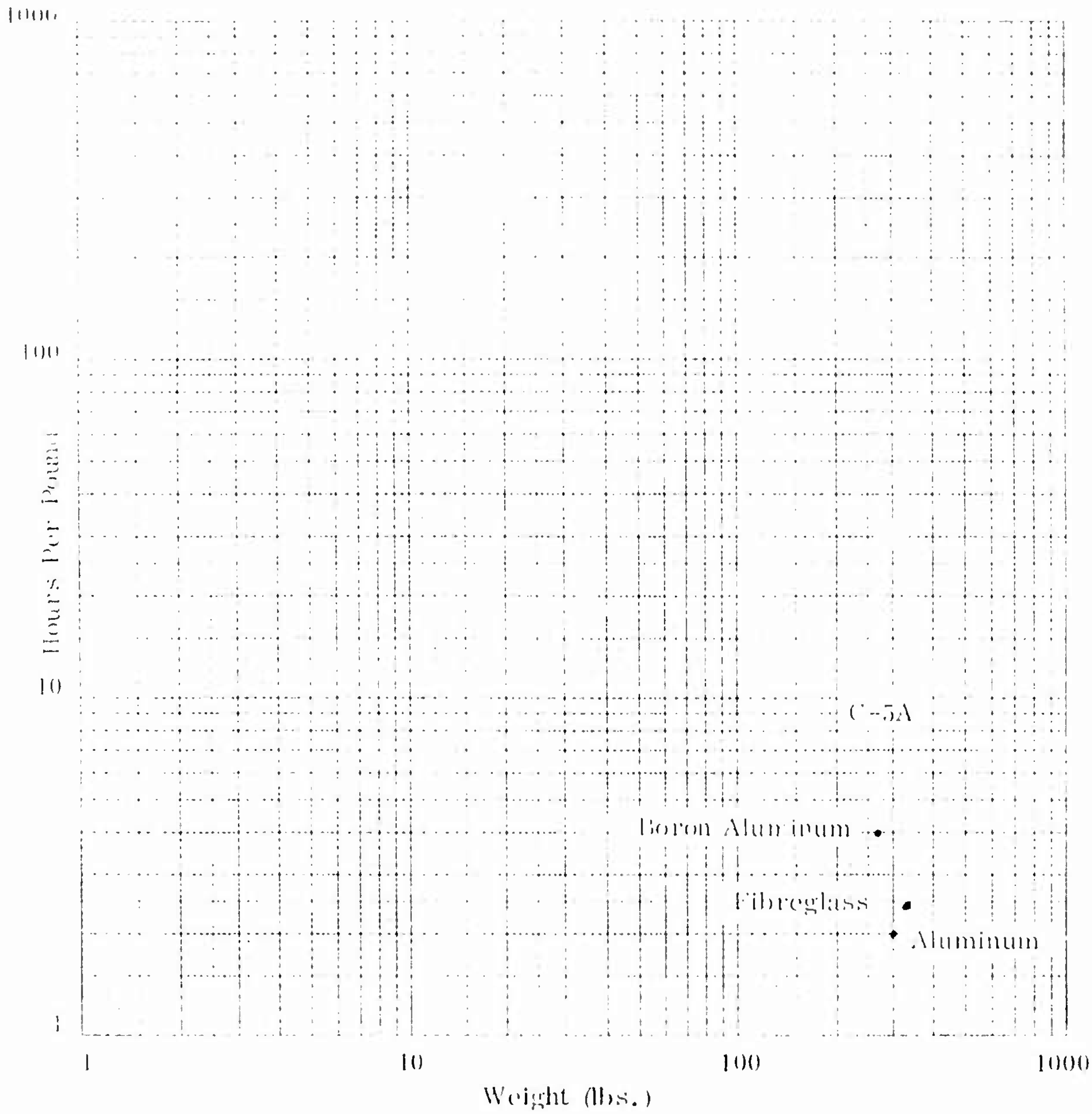

Figure F-33. Rudder Detailed Fabrication Hours Per Pound Against Weight.

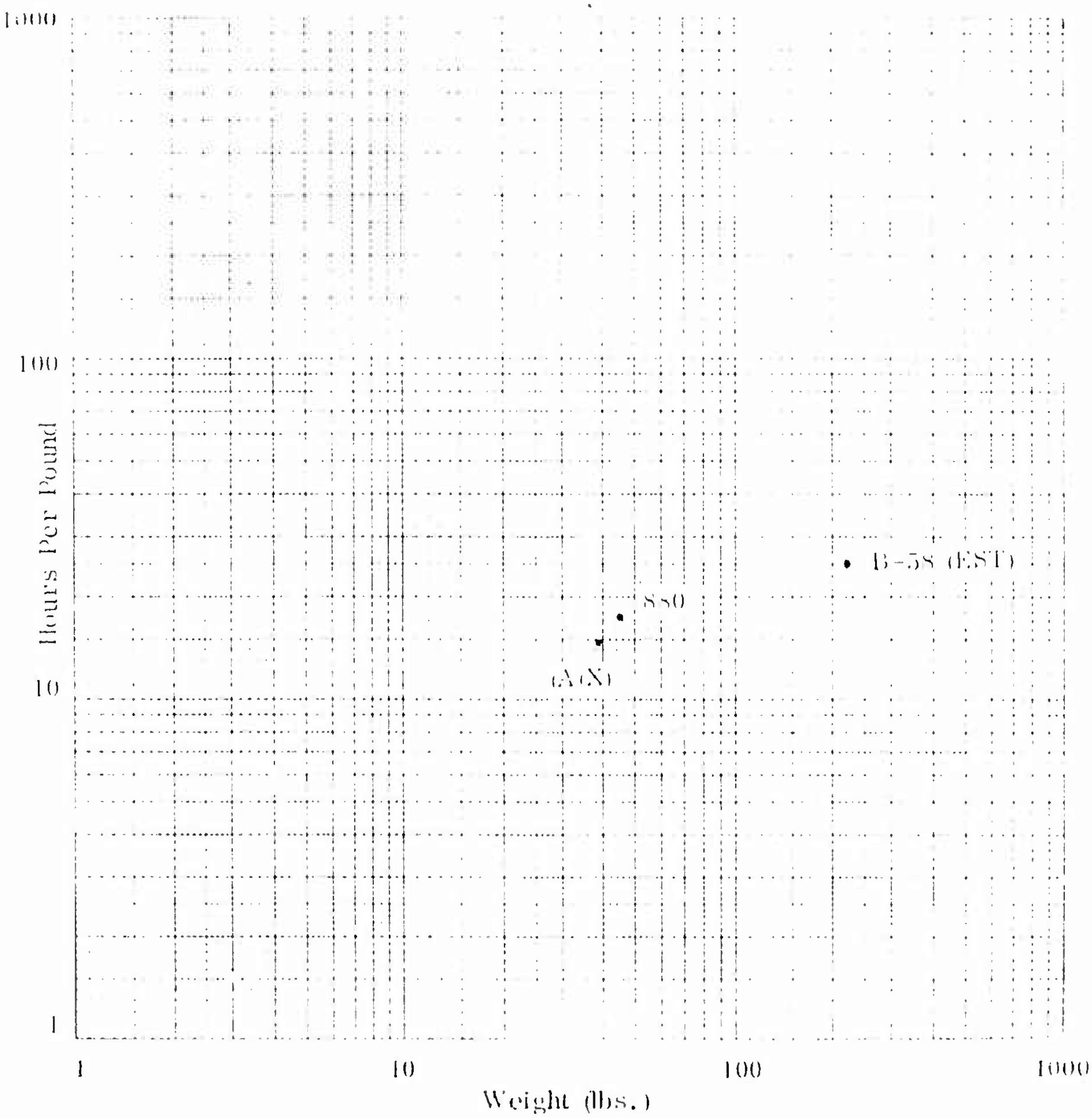

Figure F-34. Cockpit Detail Fabrication Hours Per Pound Against Weight.

Figure F-35. Nose Landing Gear Door Detail Fabrication
Hours Per Pound Against Weight.

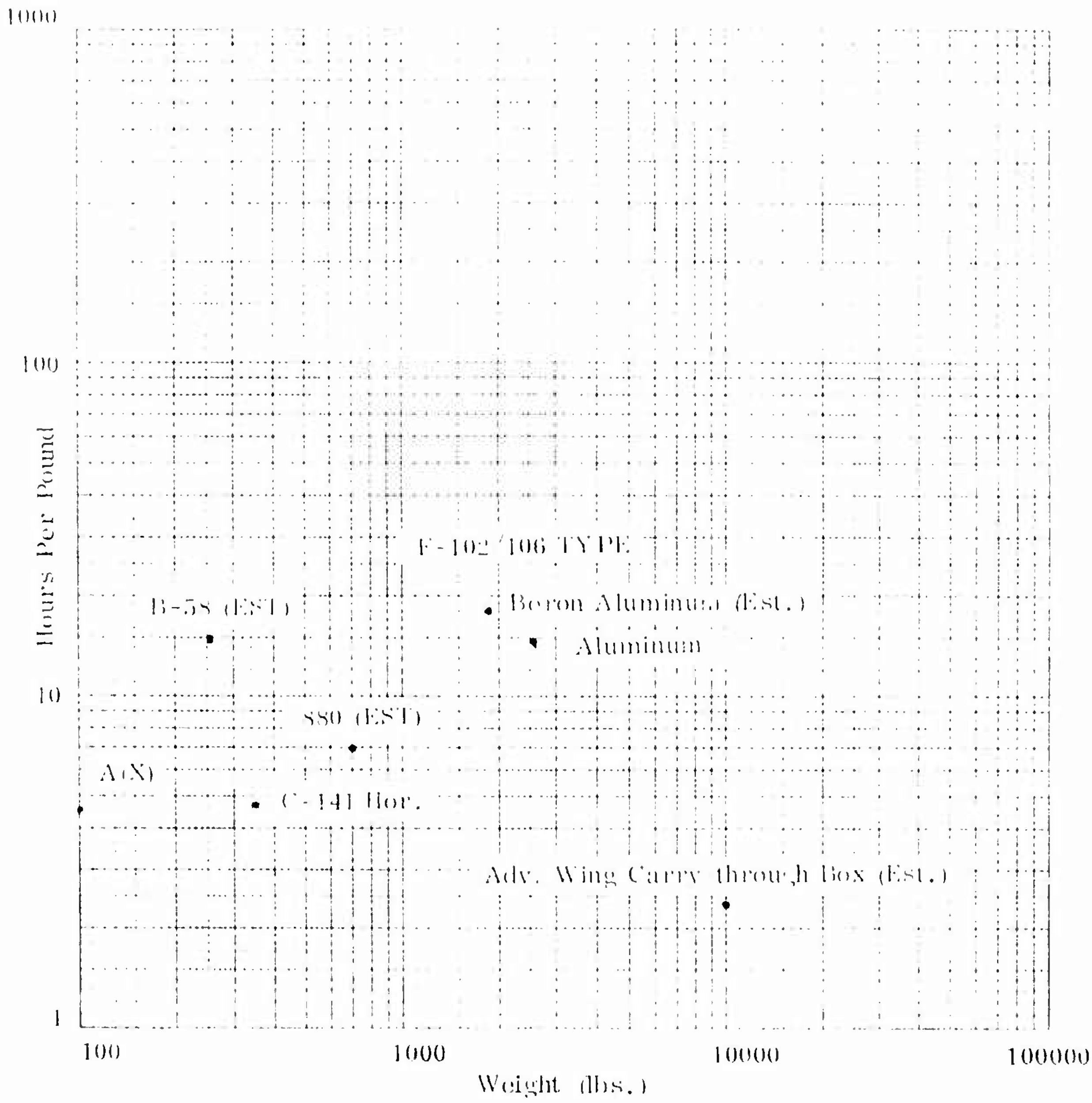

Figure F-36. Wing Carry through Box Detail Fabrication Hours Per Pound Against Weight.

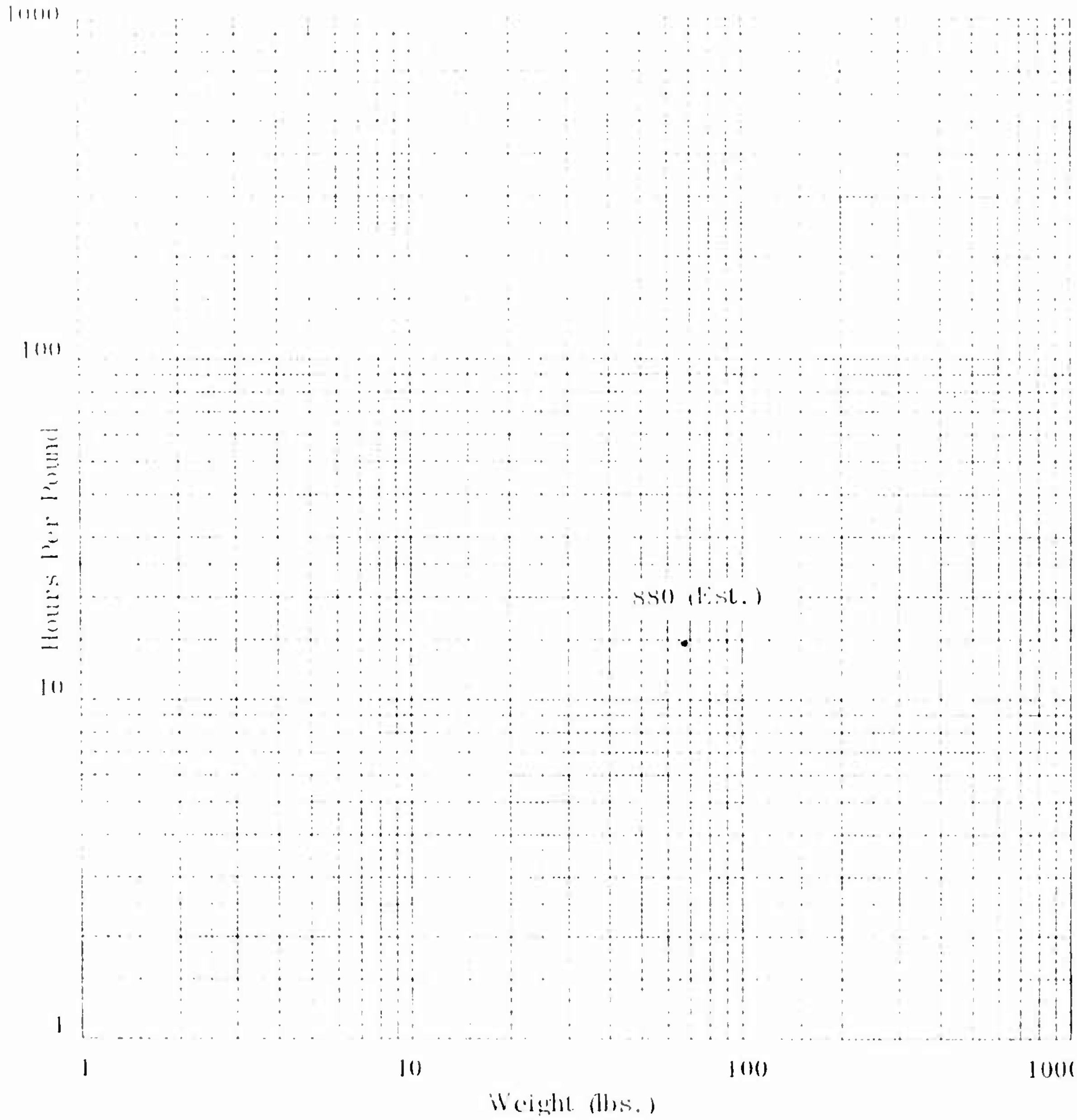

Figure F-37. Tail Attachment Detail Fabrication
Hours Per Pound Against Weight.

Figure F-38. Canopy Structure Detail Fabrication Hours Per Pound Against Weight.

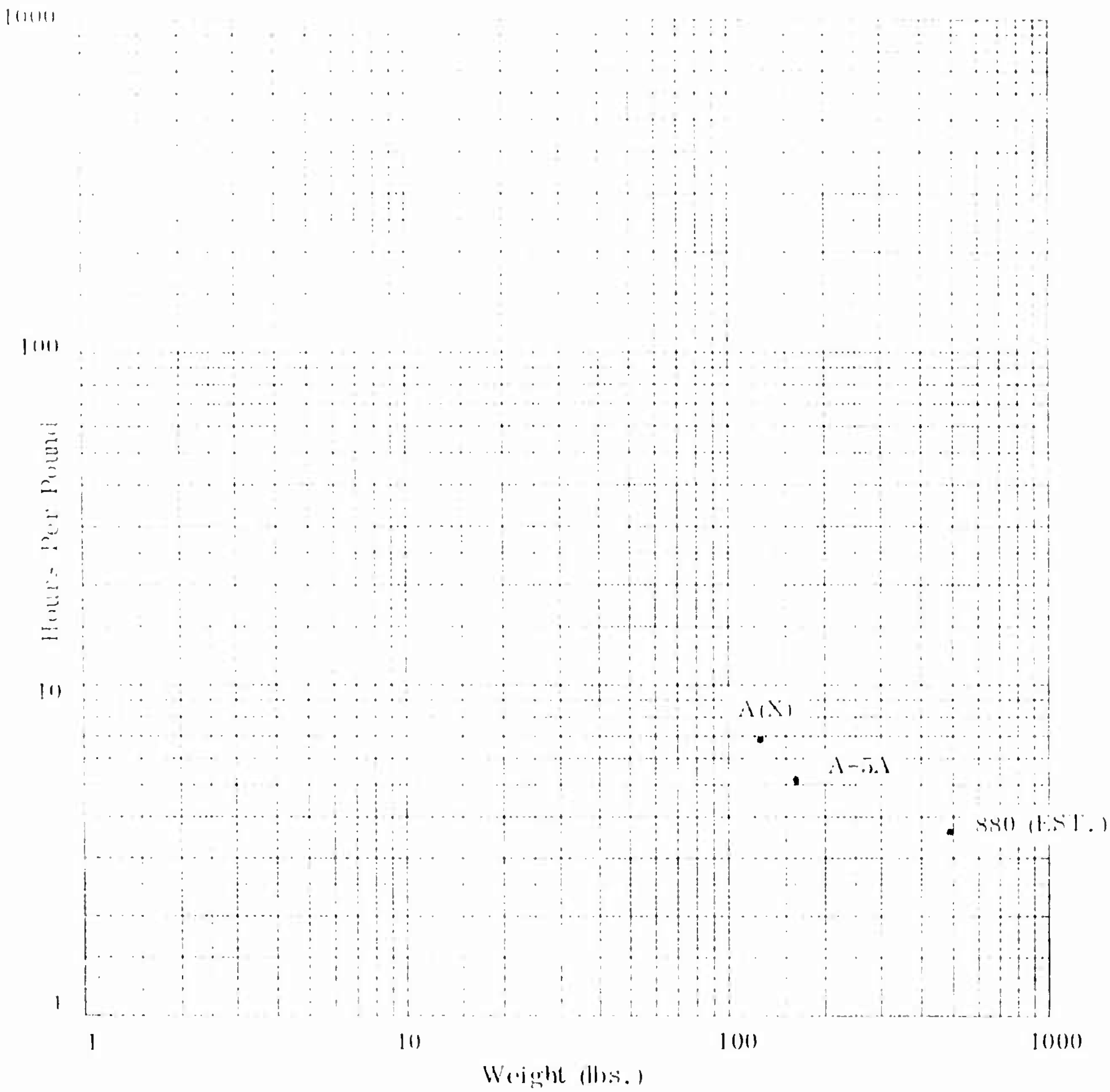

Figure F-39. Main Landing Gear Door Detail Fabrication
Hours Per Pound Against Weight.

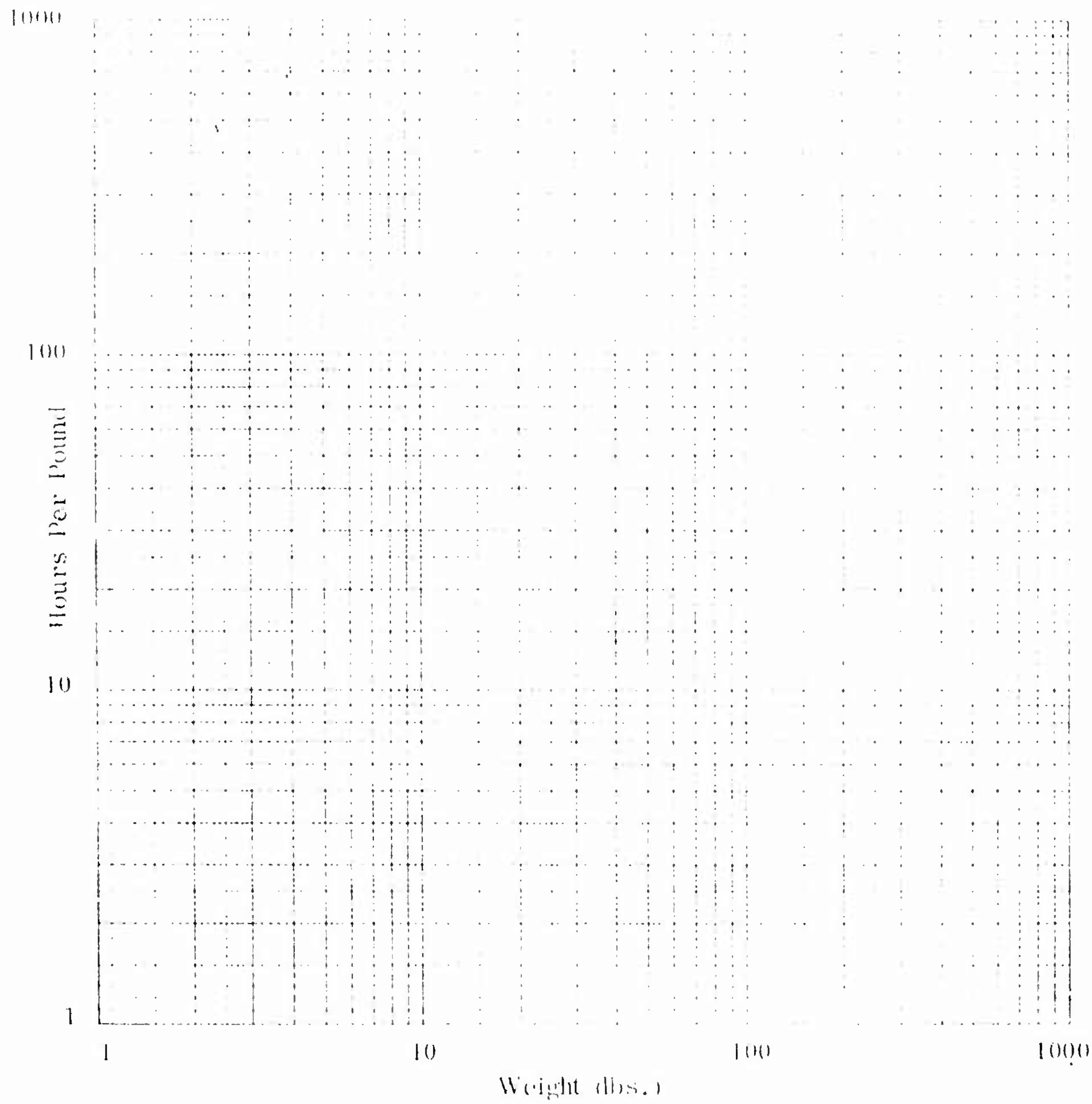

Figure F-40. Fuel Provisions Detail Fabrication
Hours Per Pound Against Weight.

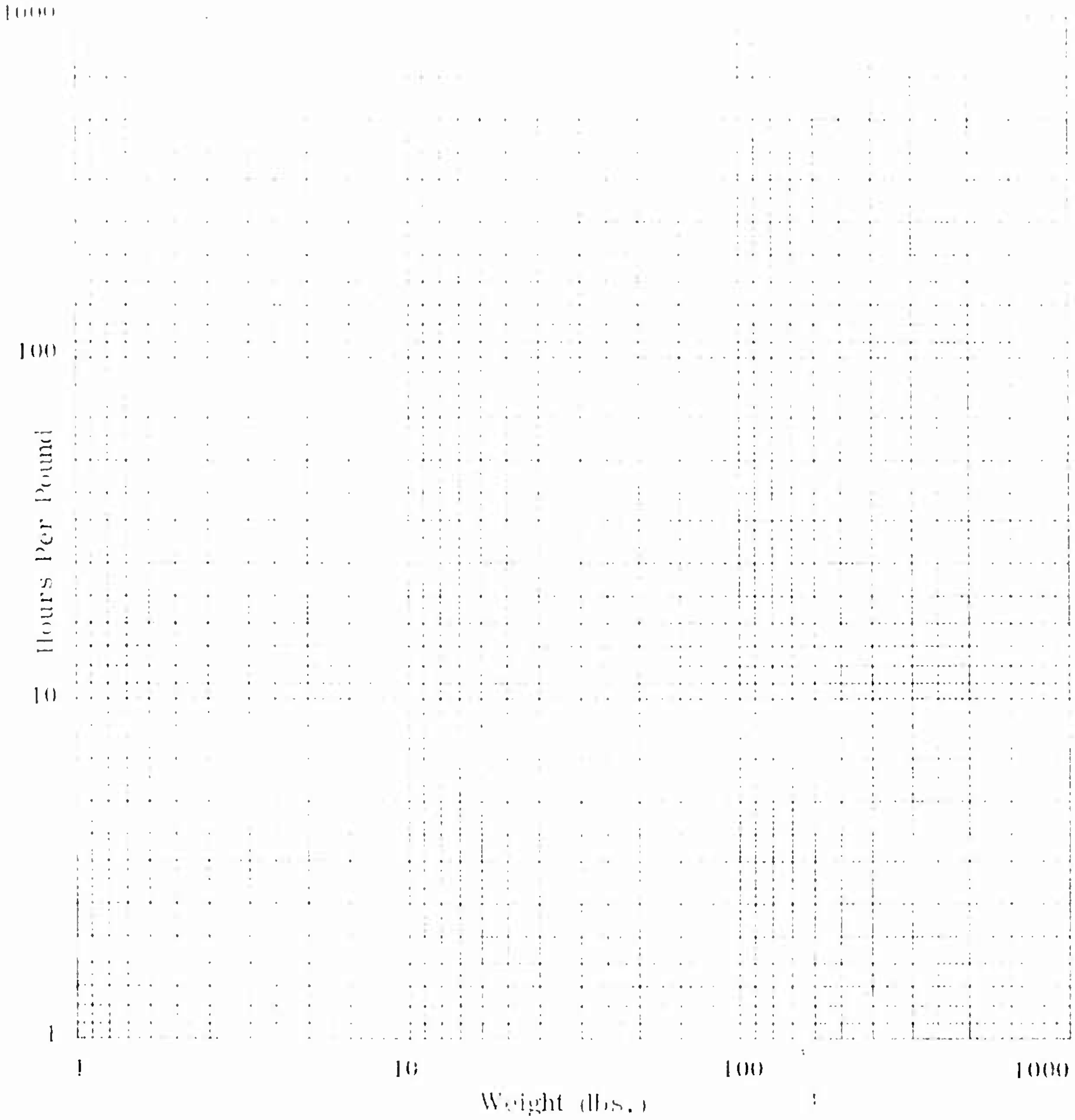

Figure F-41. Engine Provisions Detail Fabrication
Hours Per Pound Against Weight.

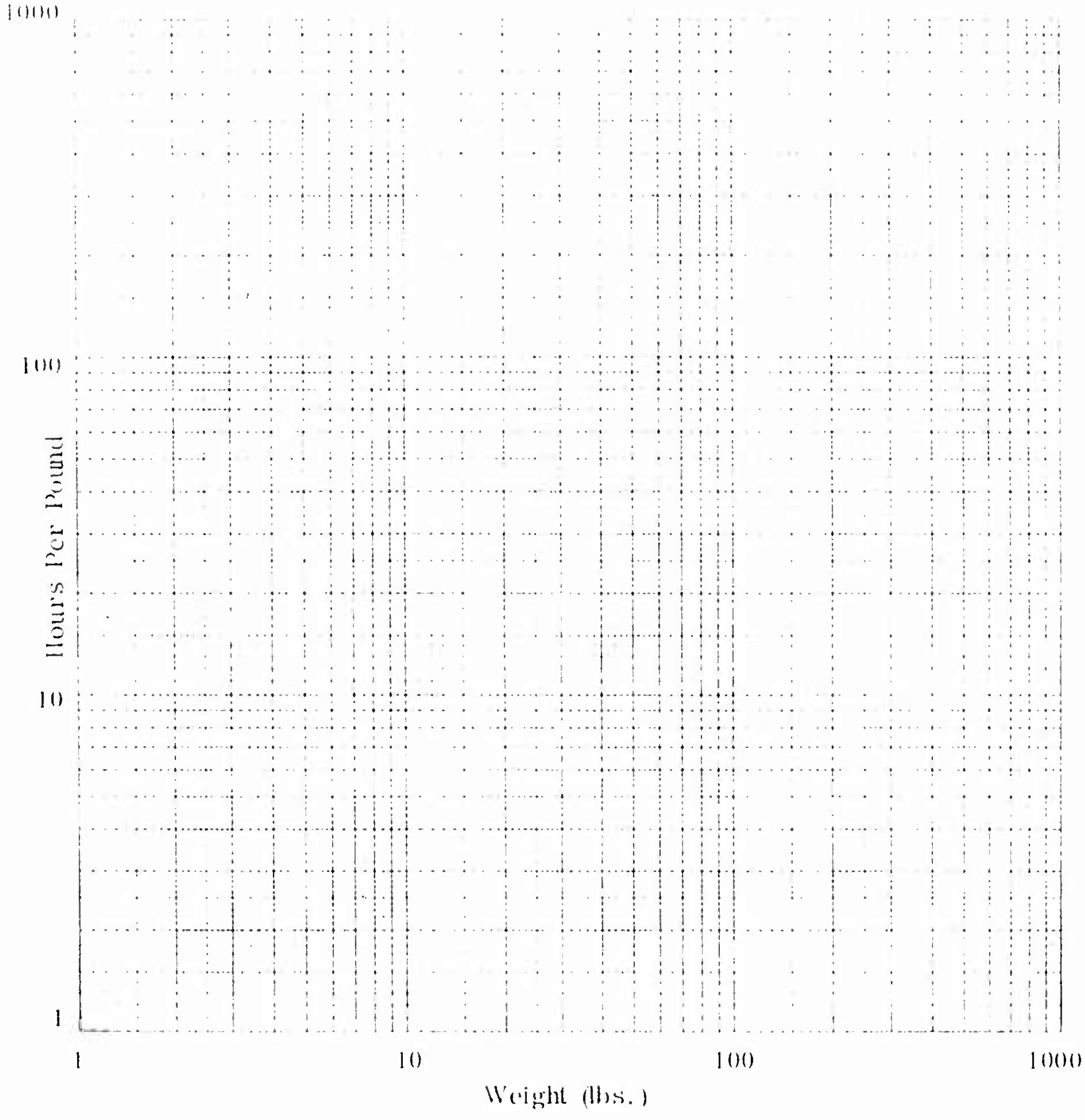

Figure F-42. Duct Provisions Detail Fabrication Hours Per Pound Against Weight.

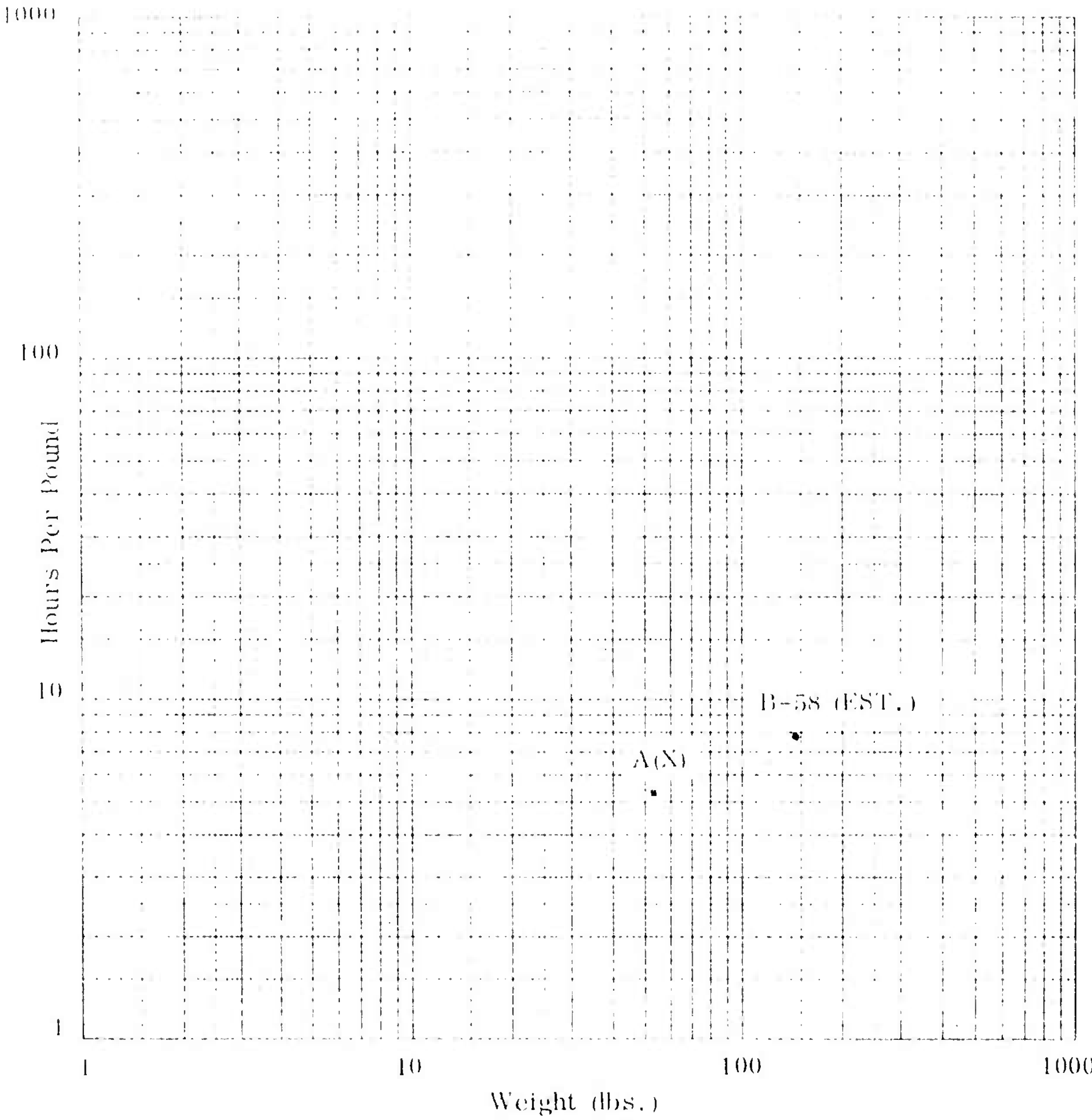

Figure F-43. Stores Provisions Detail Fabrication Hours Per Pound Against Weight.

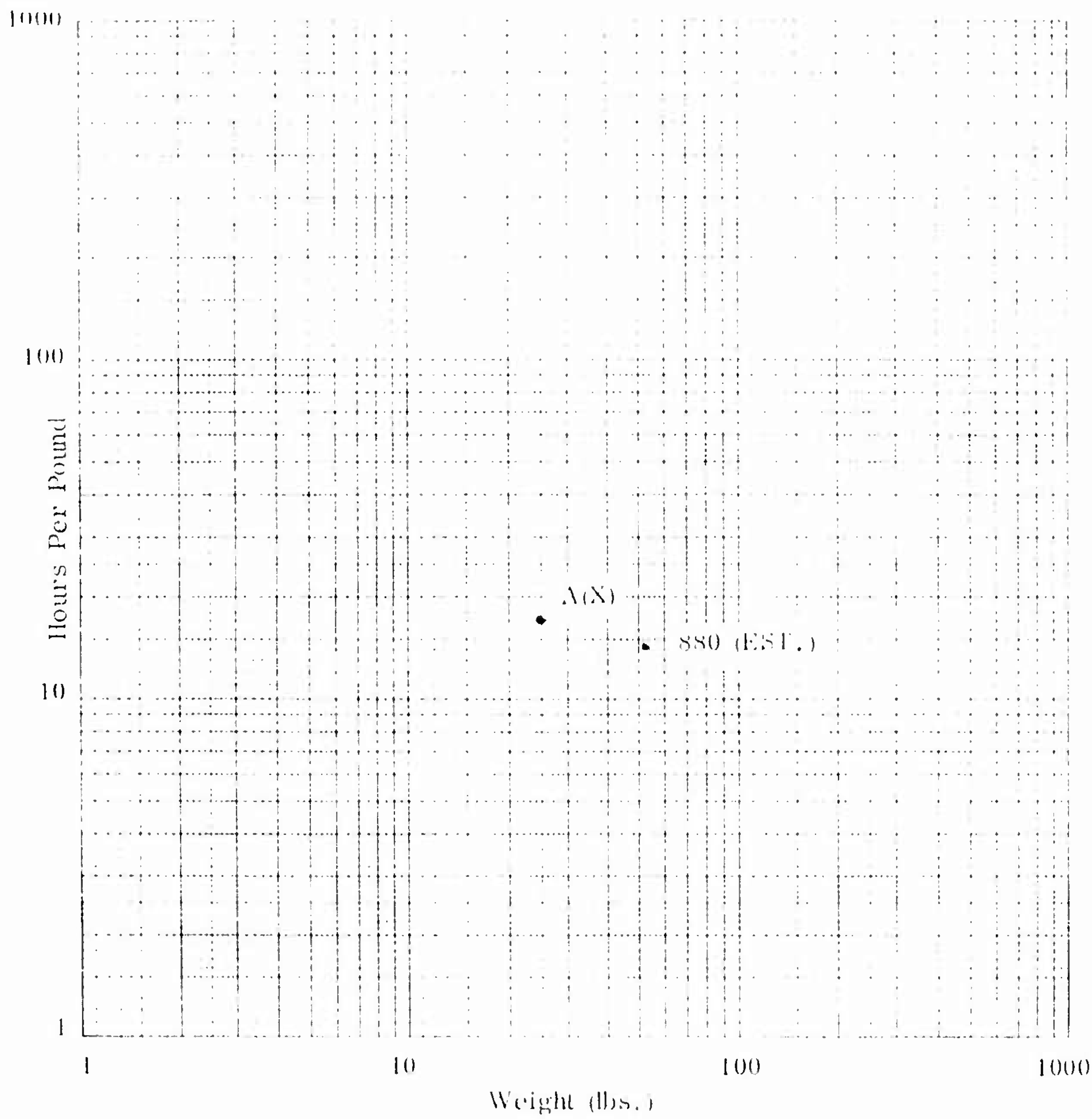

Figure F-44. Speed Brakes Detail Fabrication
Hours Per Pound Against Weight.

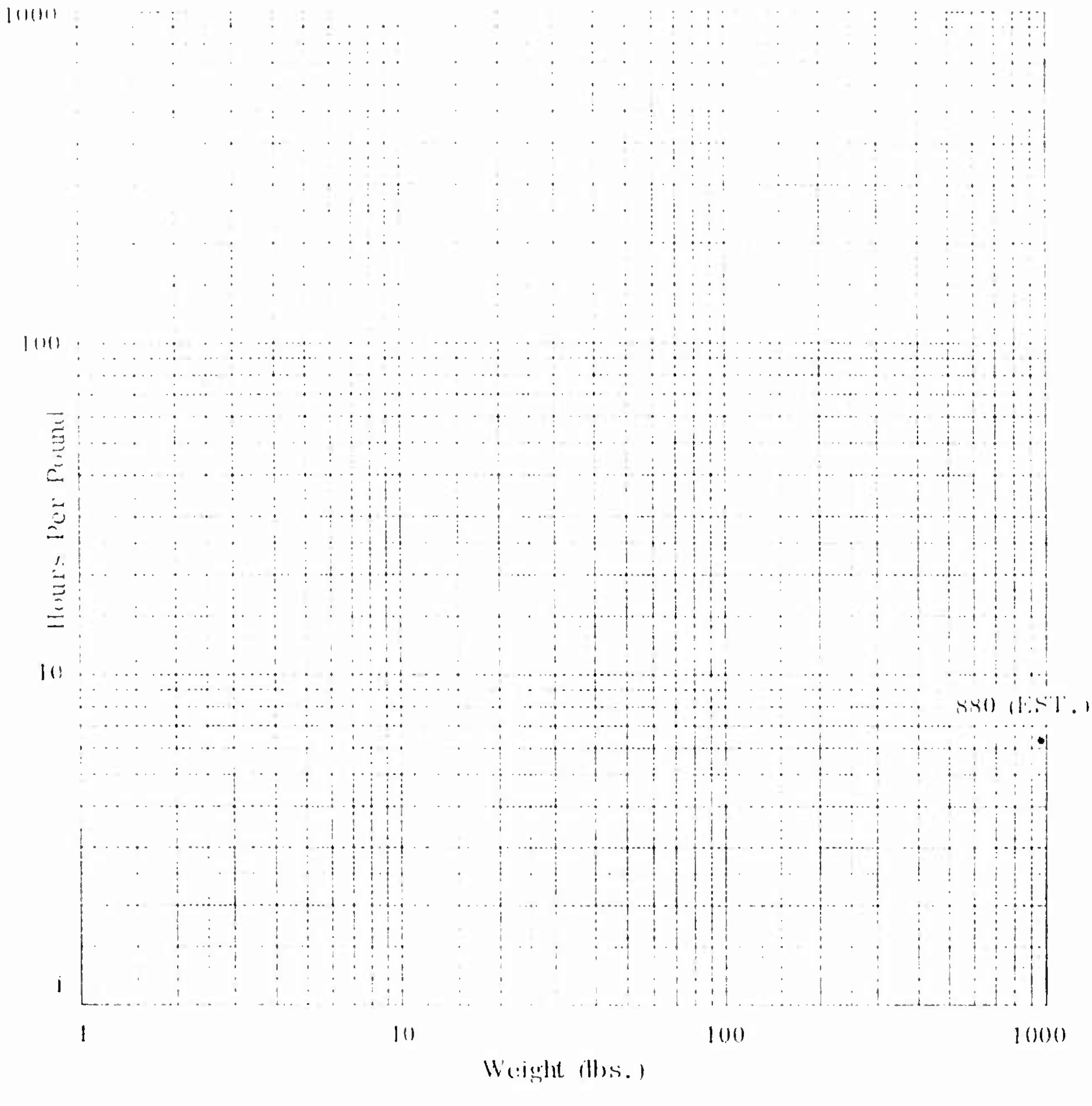

Figure F-45. Cabin Flooring and Supports Detail Fabrication Hours Per Pound Against Weight.

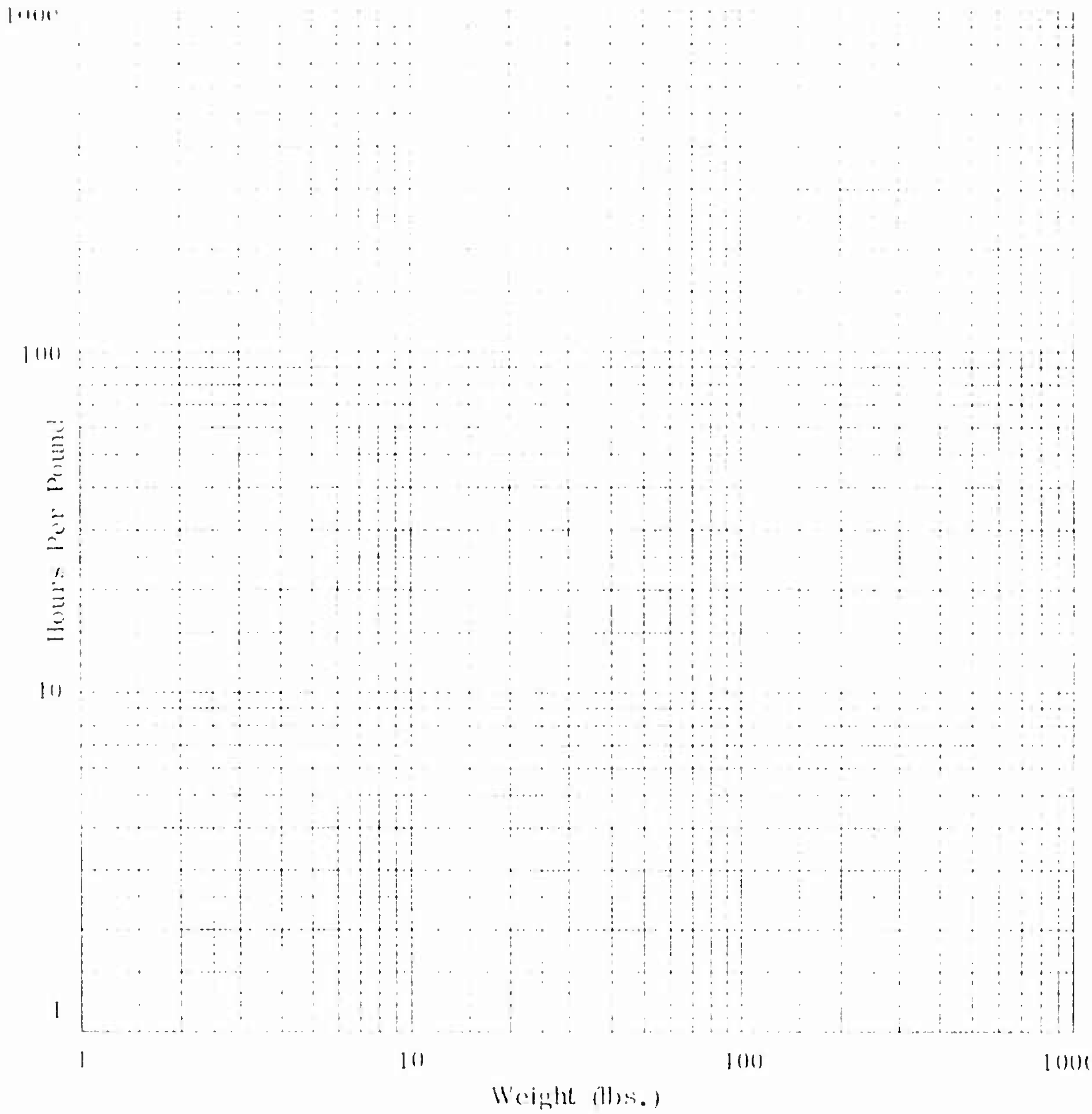

Figure F-46. Windows and Window Frames Detail Fabrication
Hours Per Pound Against Weight.

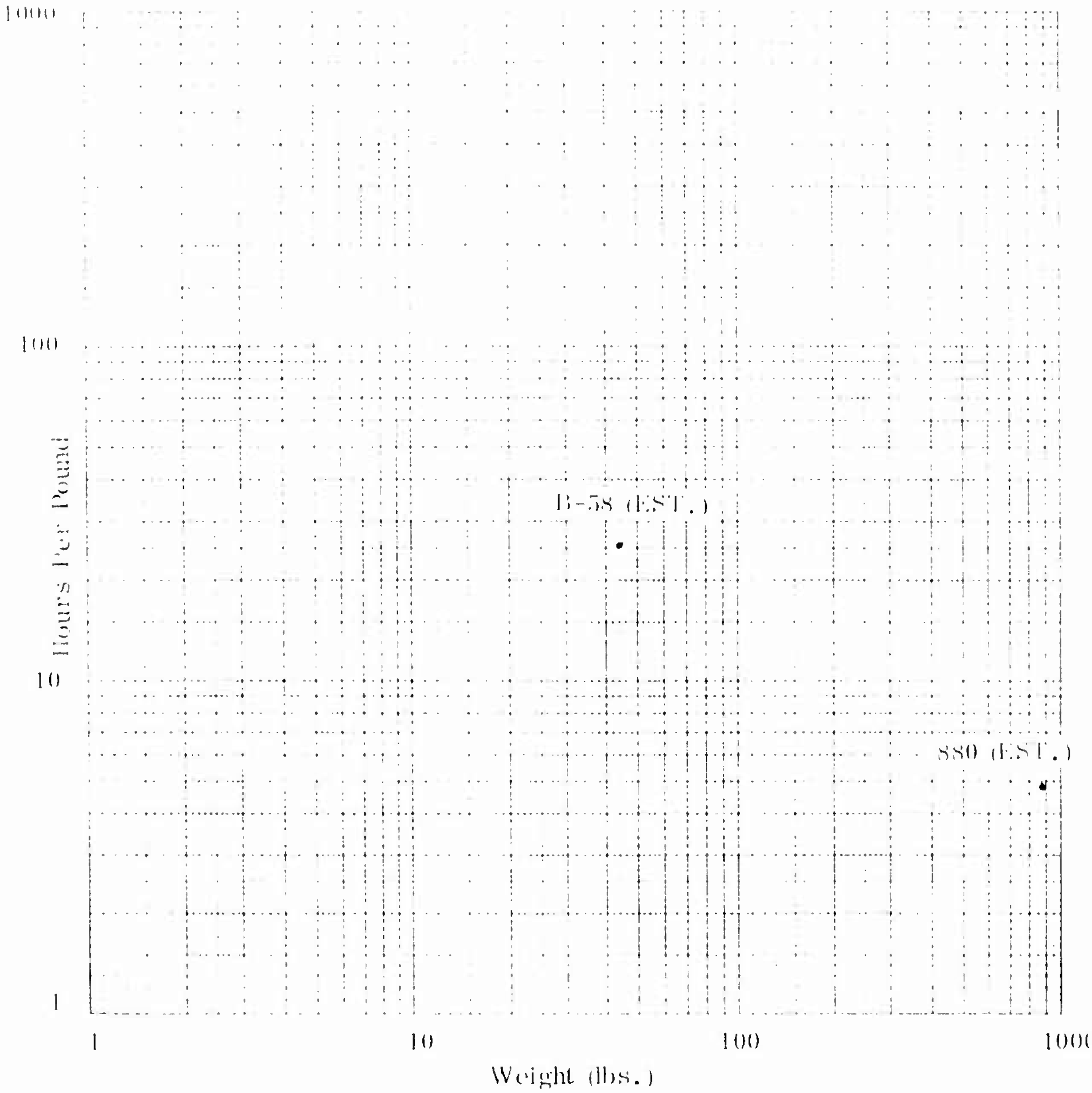

Figure F-47. Doors and Door Frames Detail Fabrication Hours Per Pound Against Weight.

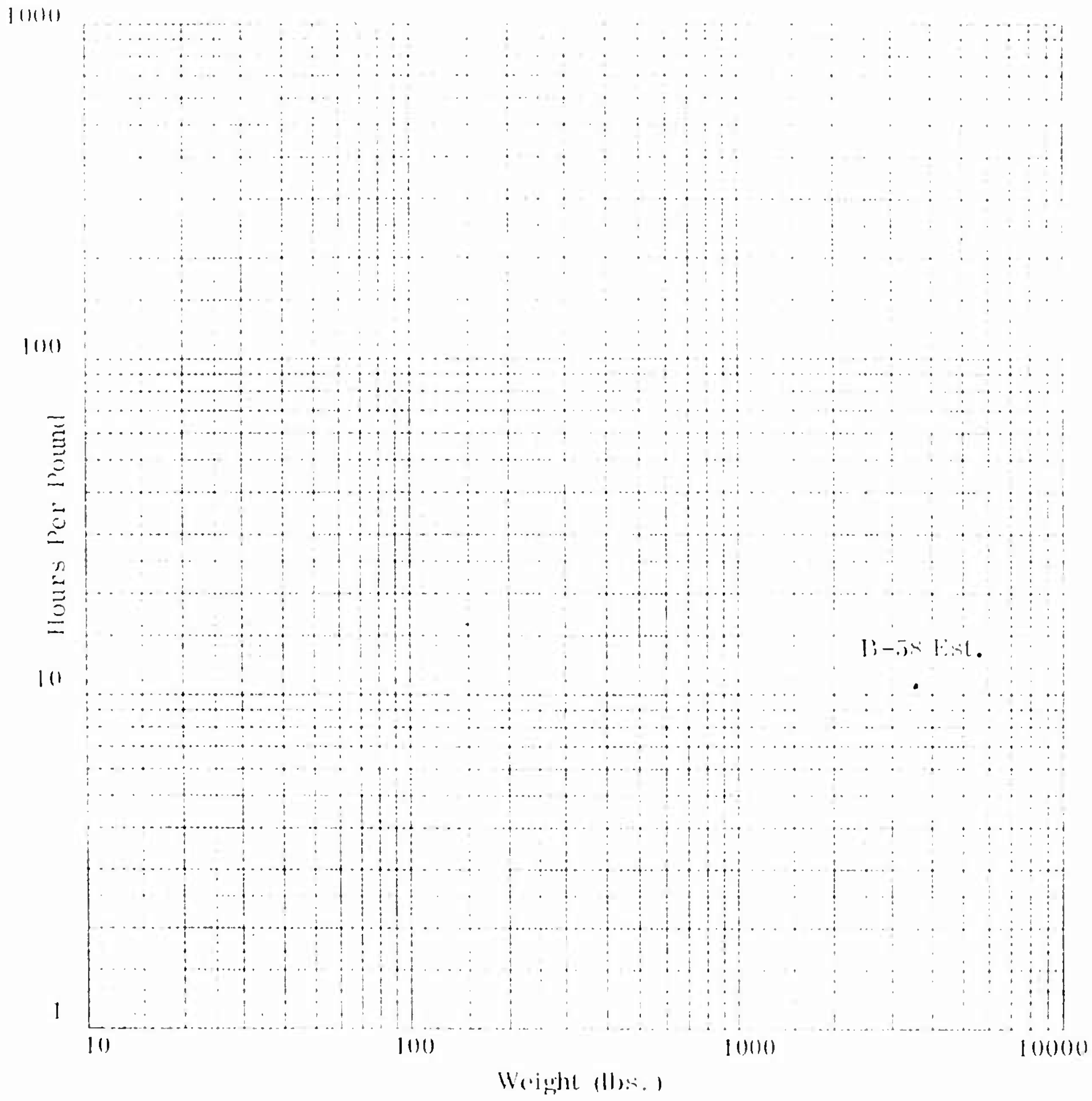

Figure F-48. Nacelle Structure Detail Fabrication
Hours Per Pound Against Weight.

Figure F-49. Nacelles - Pylons Detail Fabrication
Hours Per Pound Against Weight.

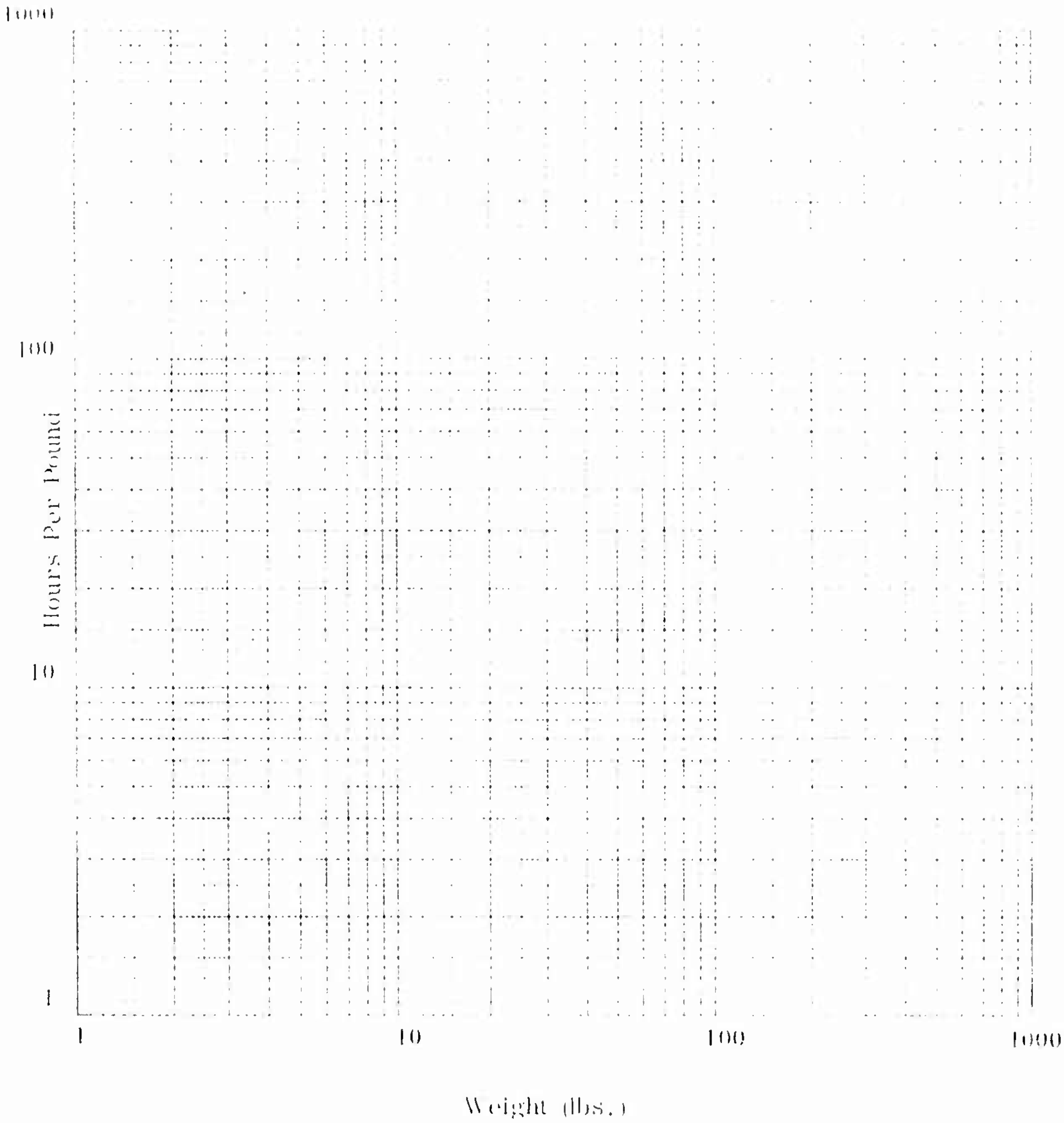

Figure F-50. Nacelles - Main Landing Gear Door Detail Fabrication Hours Per Pound Against Weight.

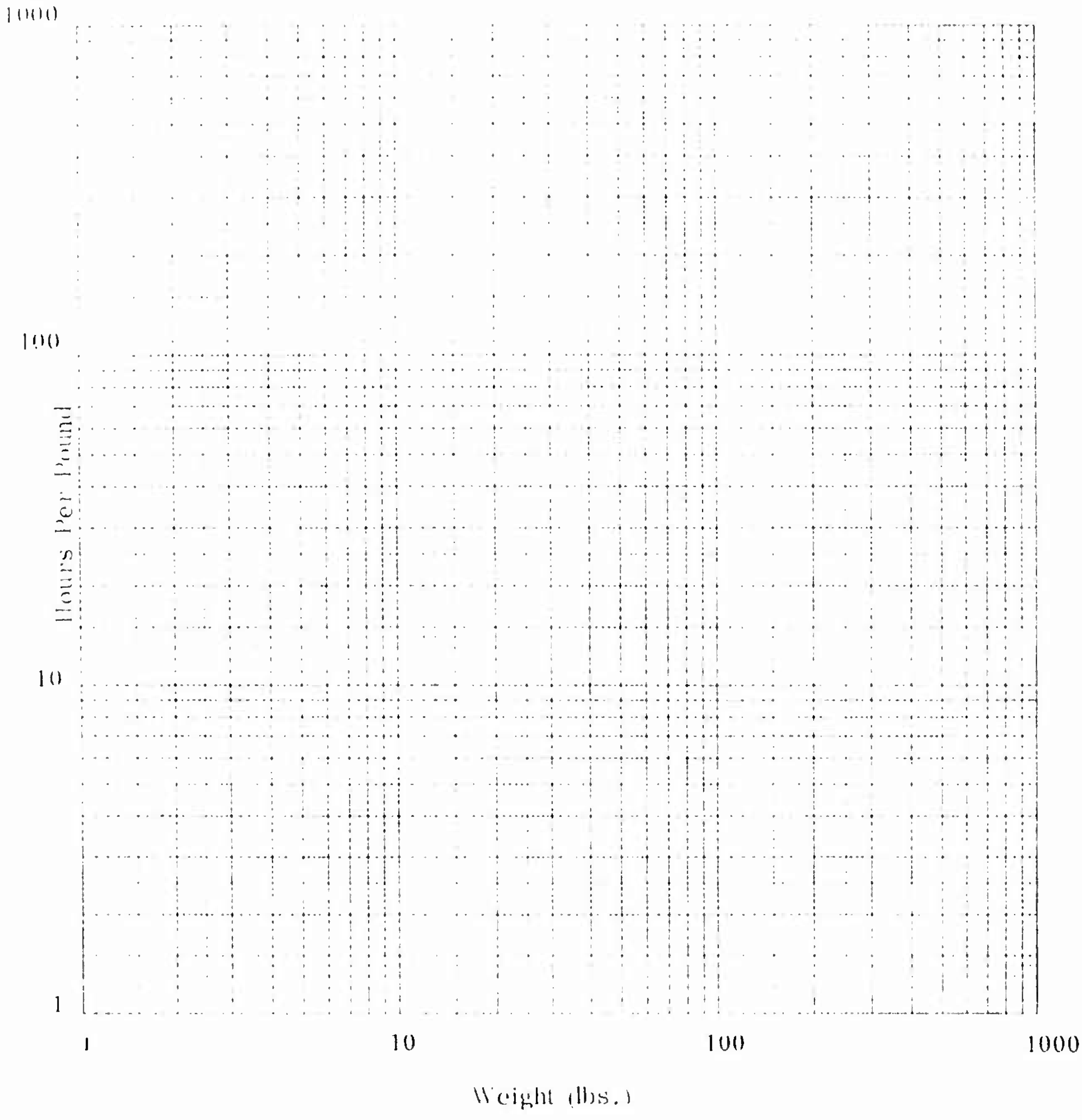

Figure F-51. Brakes Detail Fabrication Hours Per Pound Against Weight.

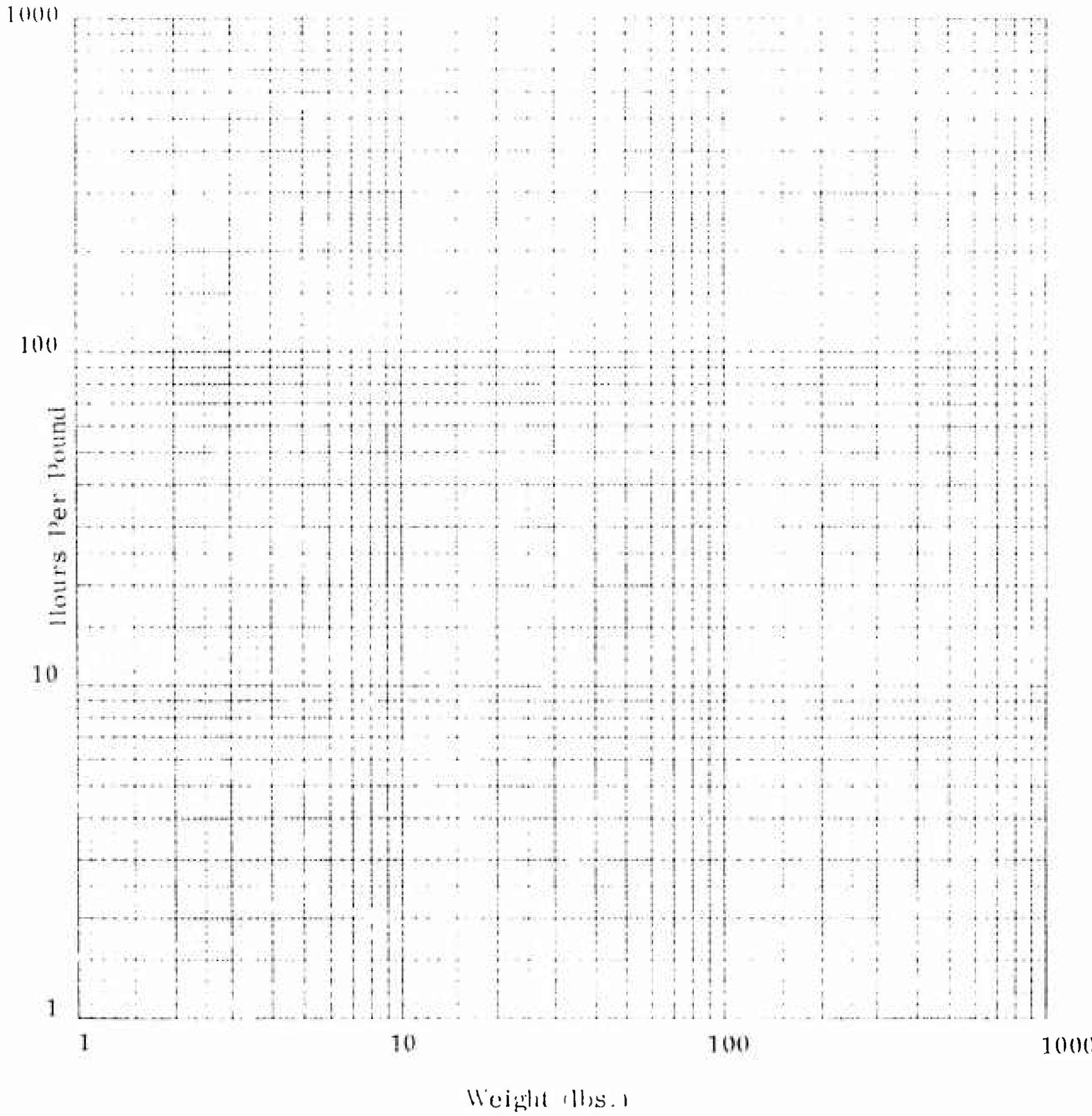

Figure F-52. Brake Controls Detail Fabrication Hours Per Pound Against Weight.

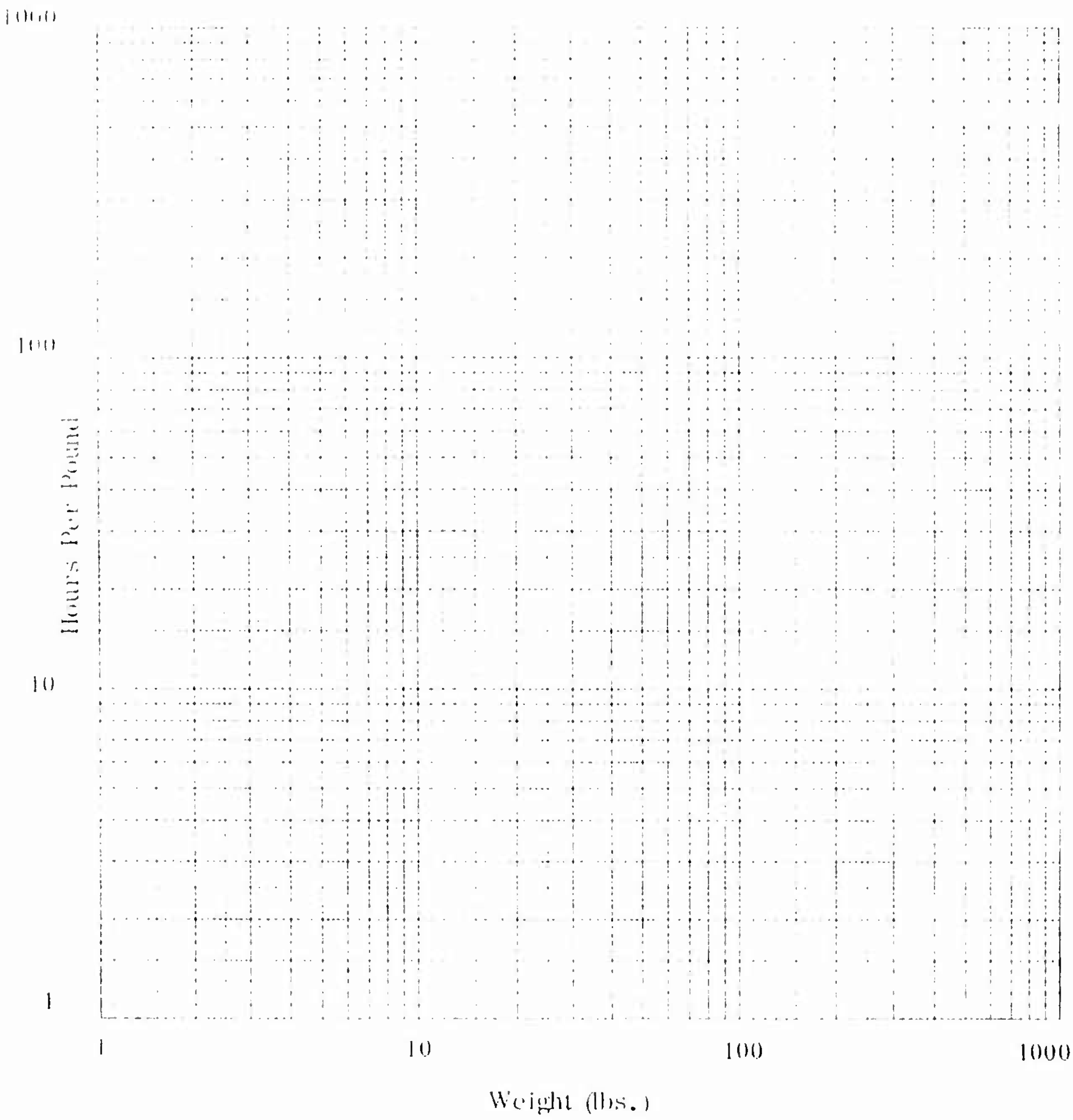

Figure F-53. Wheels Detail Fabrication Hours Per Pound Against Weight.

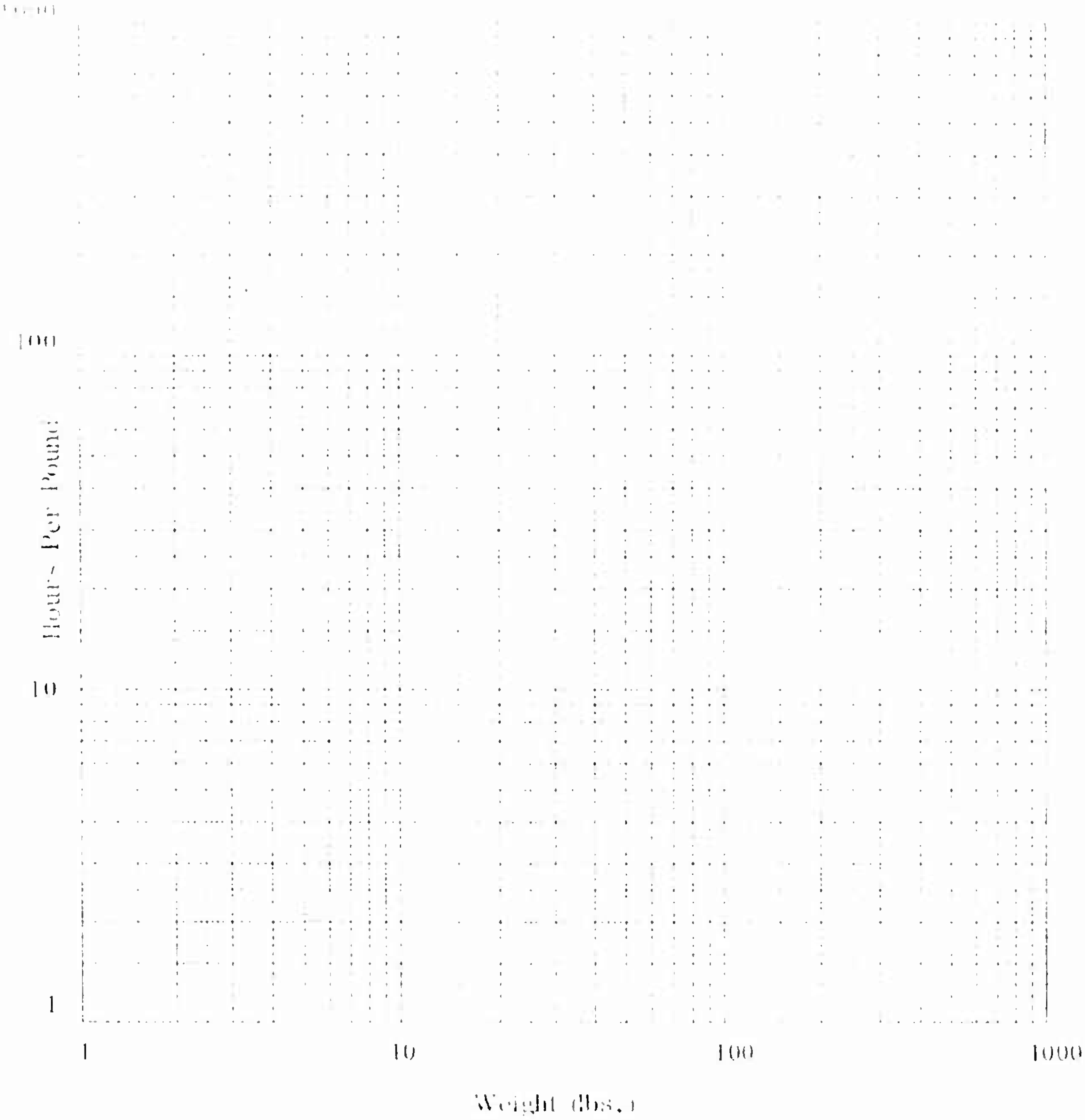

Figure F-54. Tires Detail Fabrication Hours Per Pound Against Weight.

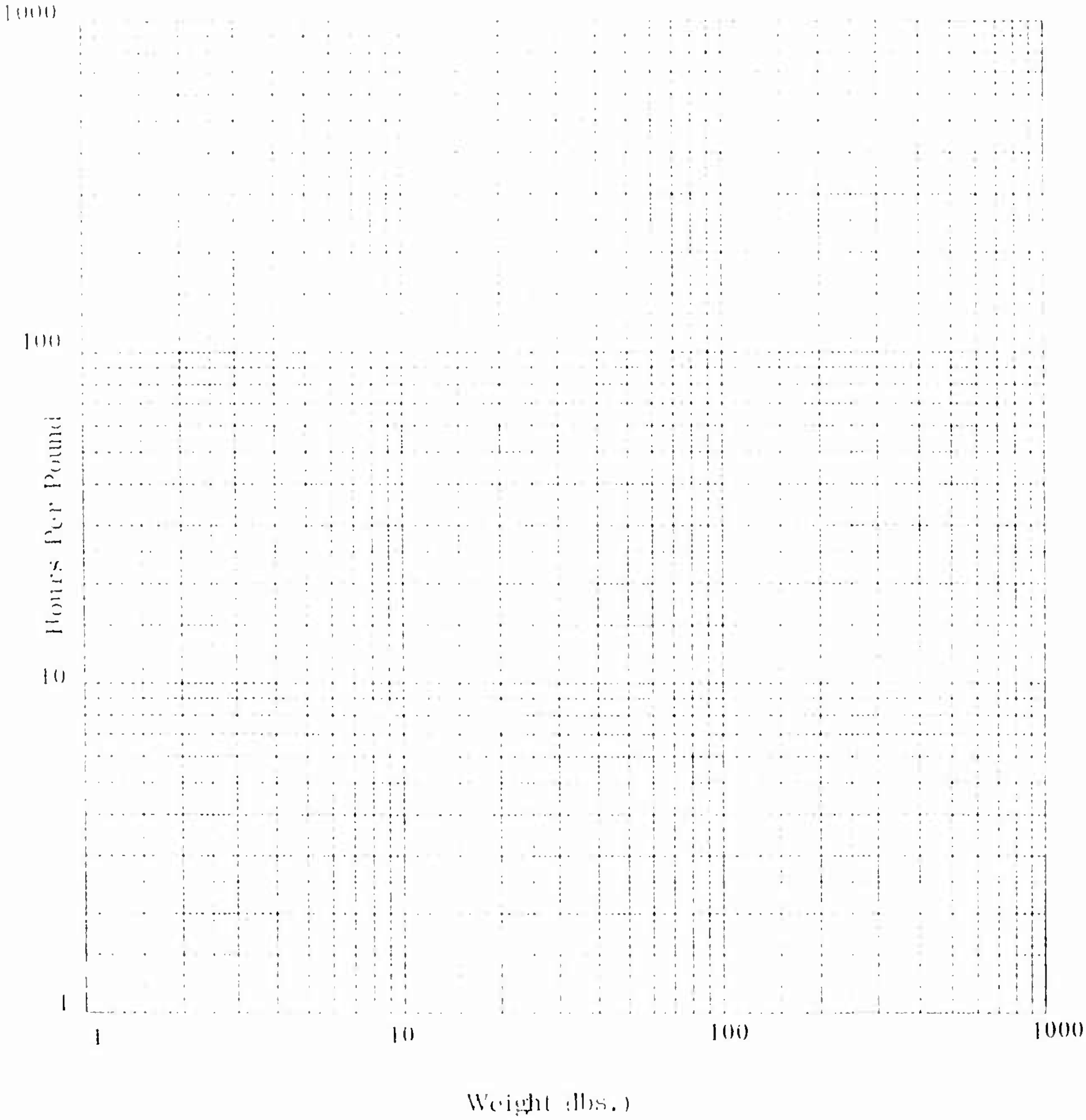

Figure F-55. Oleos Detail Fabrication Hours
Per Pound Against Weight.

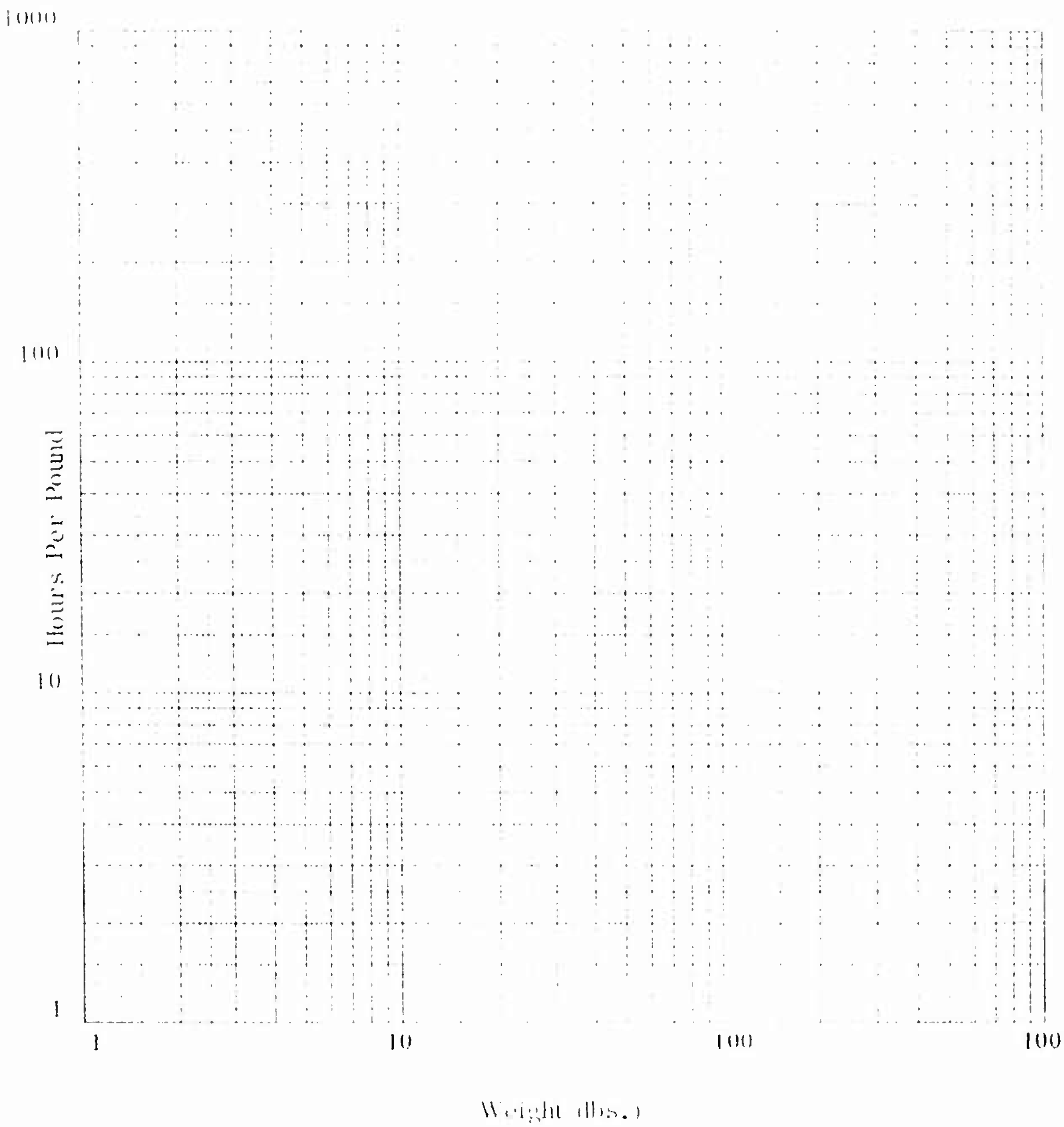

Figure F-56. Axles, Trunnions and Fittings Detail Fabrication Hours Per Pound Against Weight.

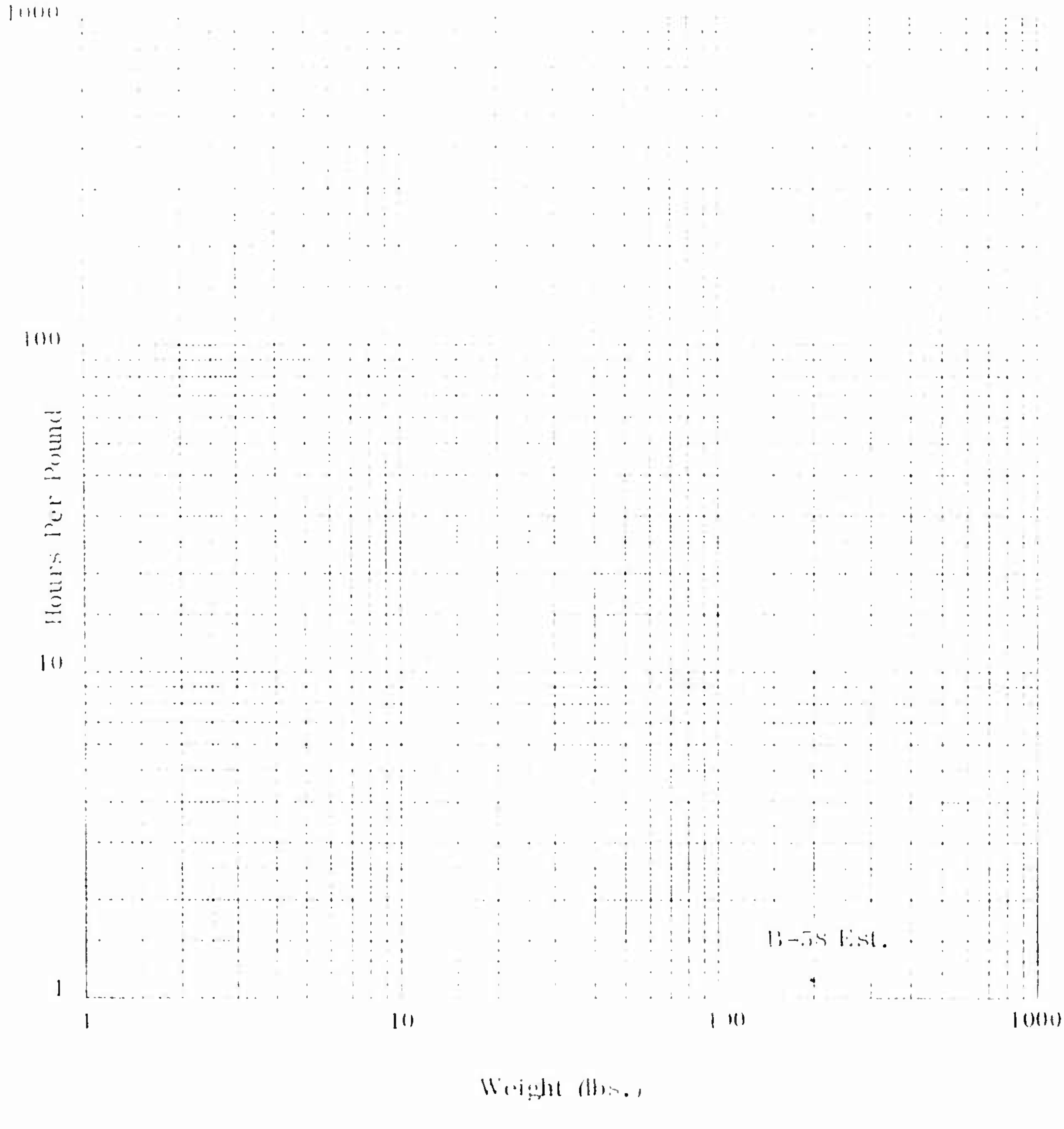

Figure F-57. Drag Braces Fabrication Hours Per Pound Against Weight.

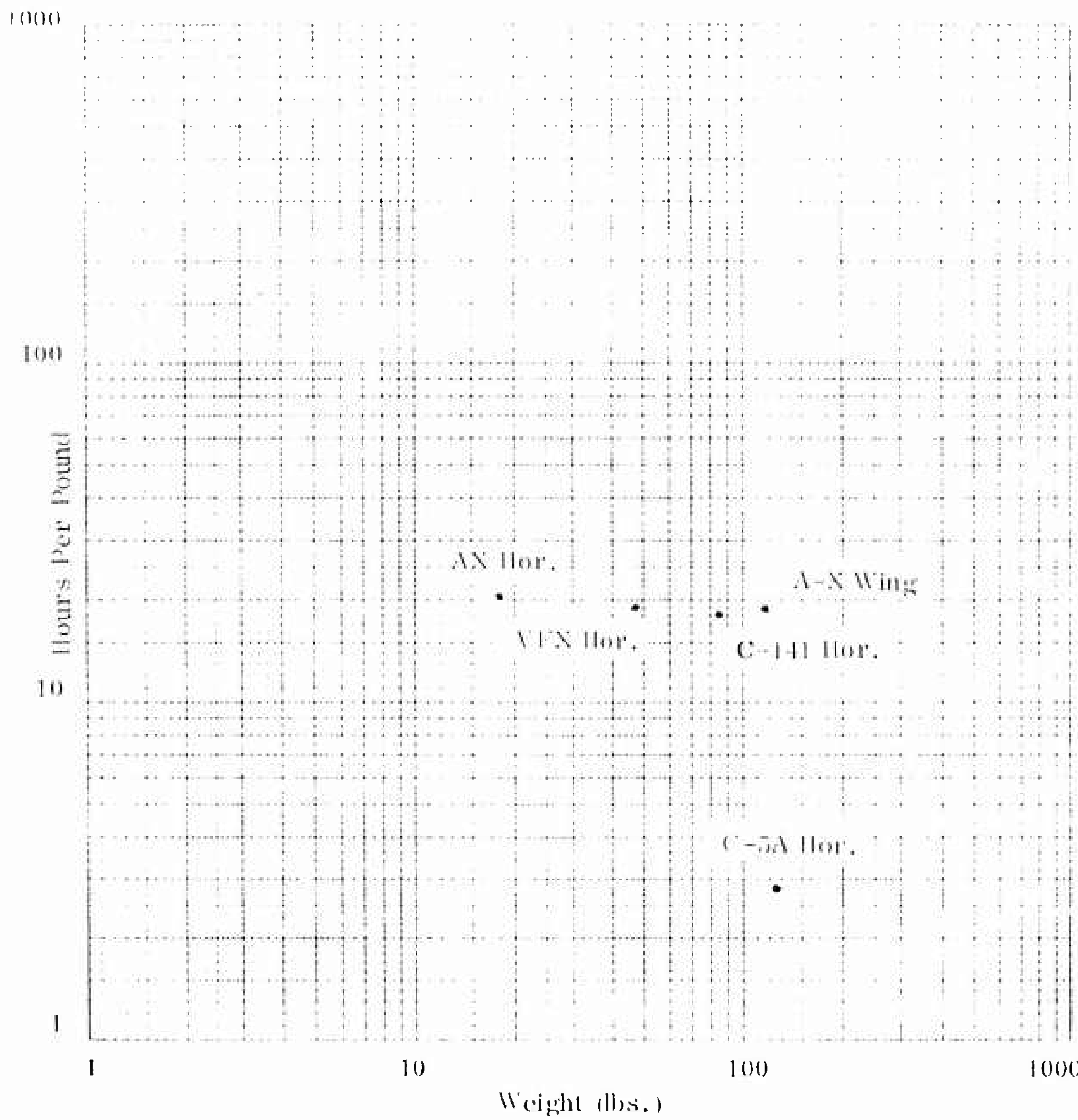

Figure F-58. Leading Edge Subassembly Hours Per Pound Against Weight.

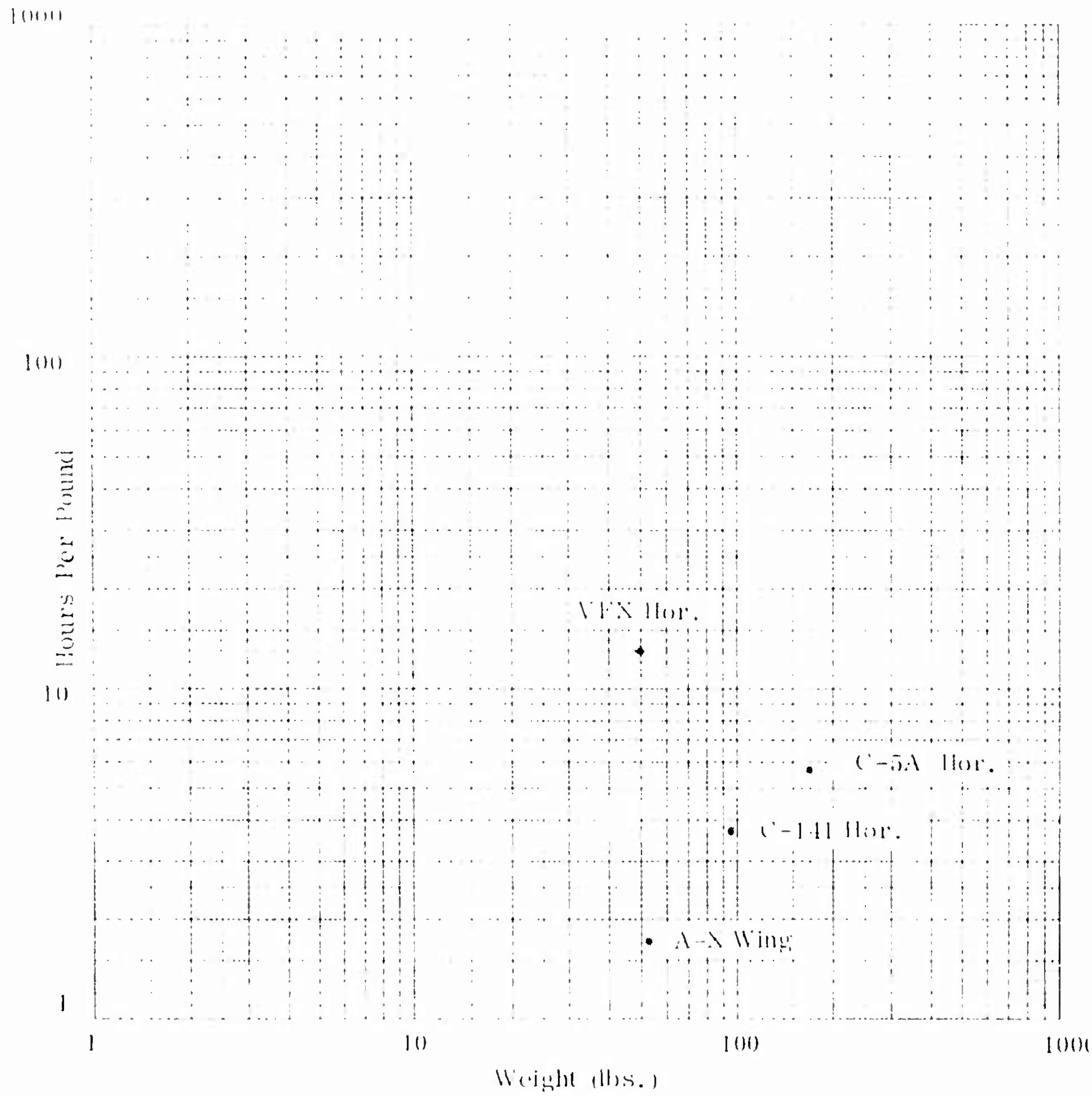

Figure F-59. Trailing Edge Subassembly Hours Per Pound Against Weight.

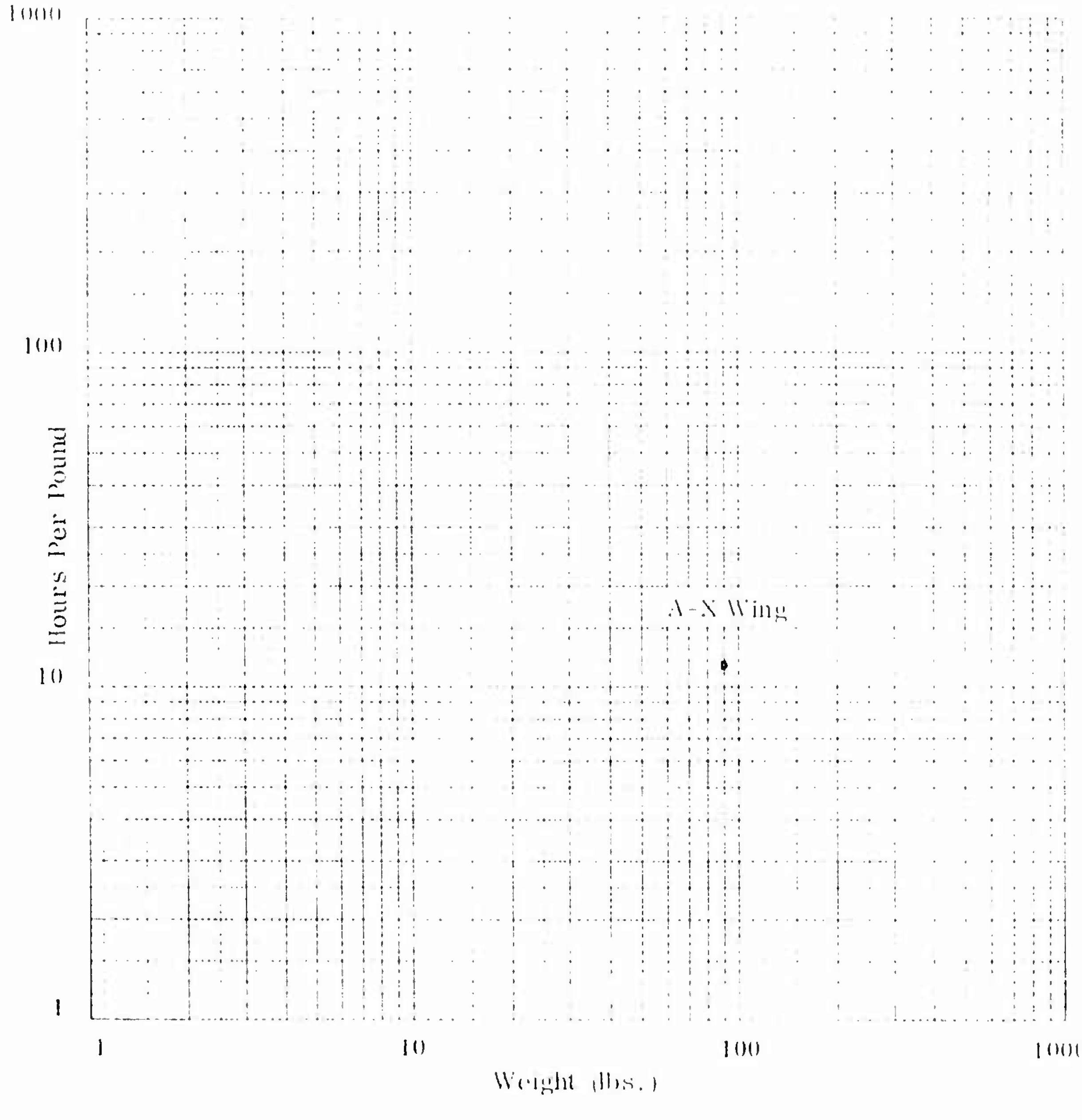

Figure F-60. Ailerons Subassembly Hours Per Pound Against Weight.

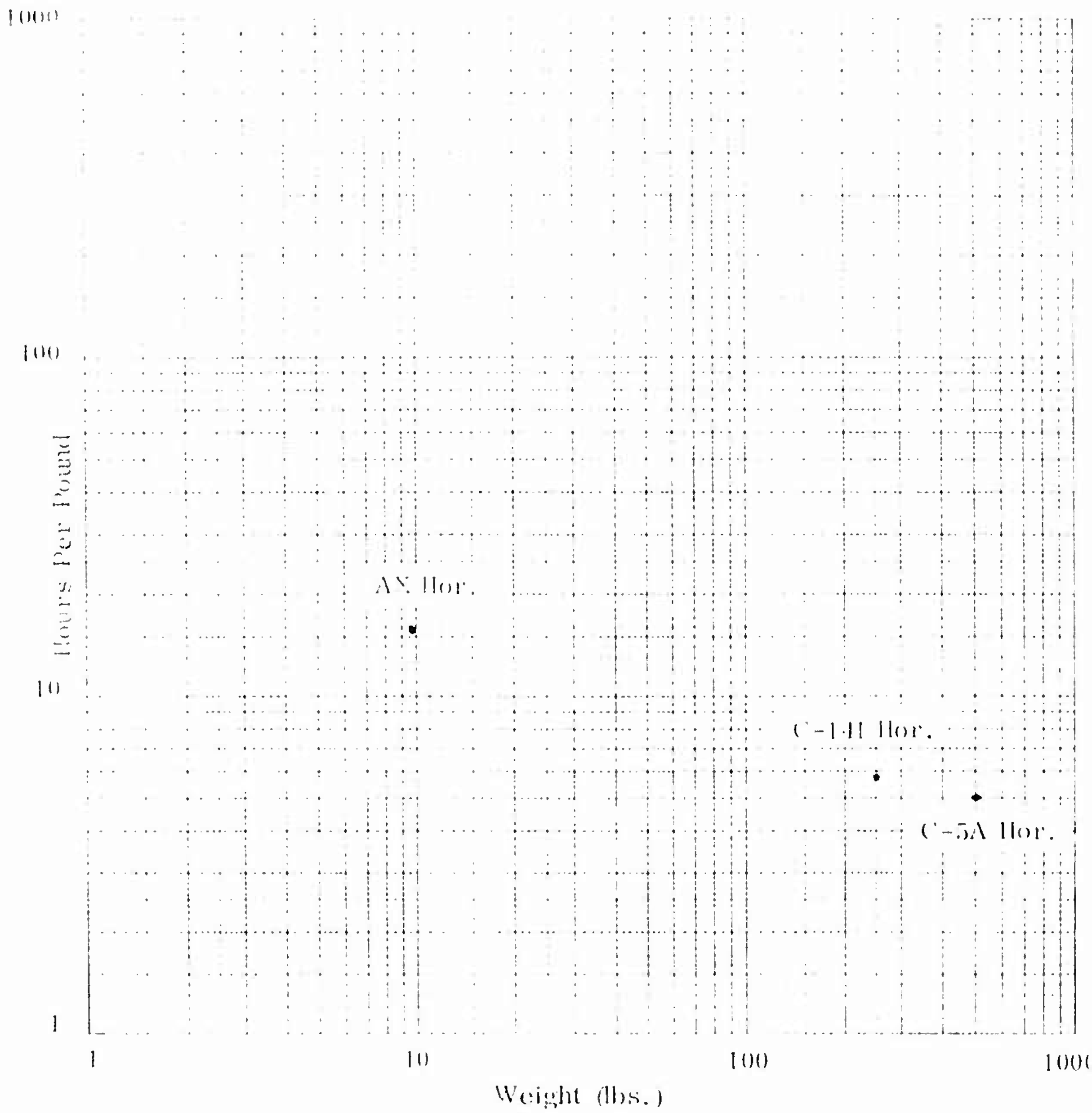

Figure F-61. Fairing Subassembly Hours Per Pound Against Weight.

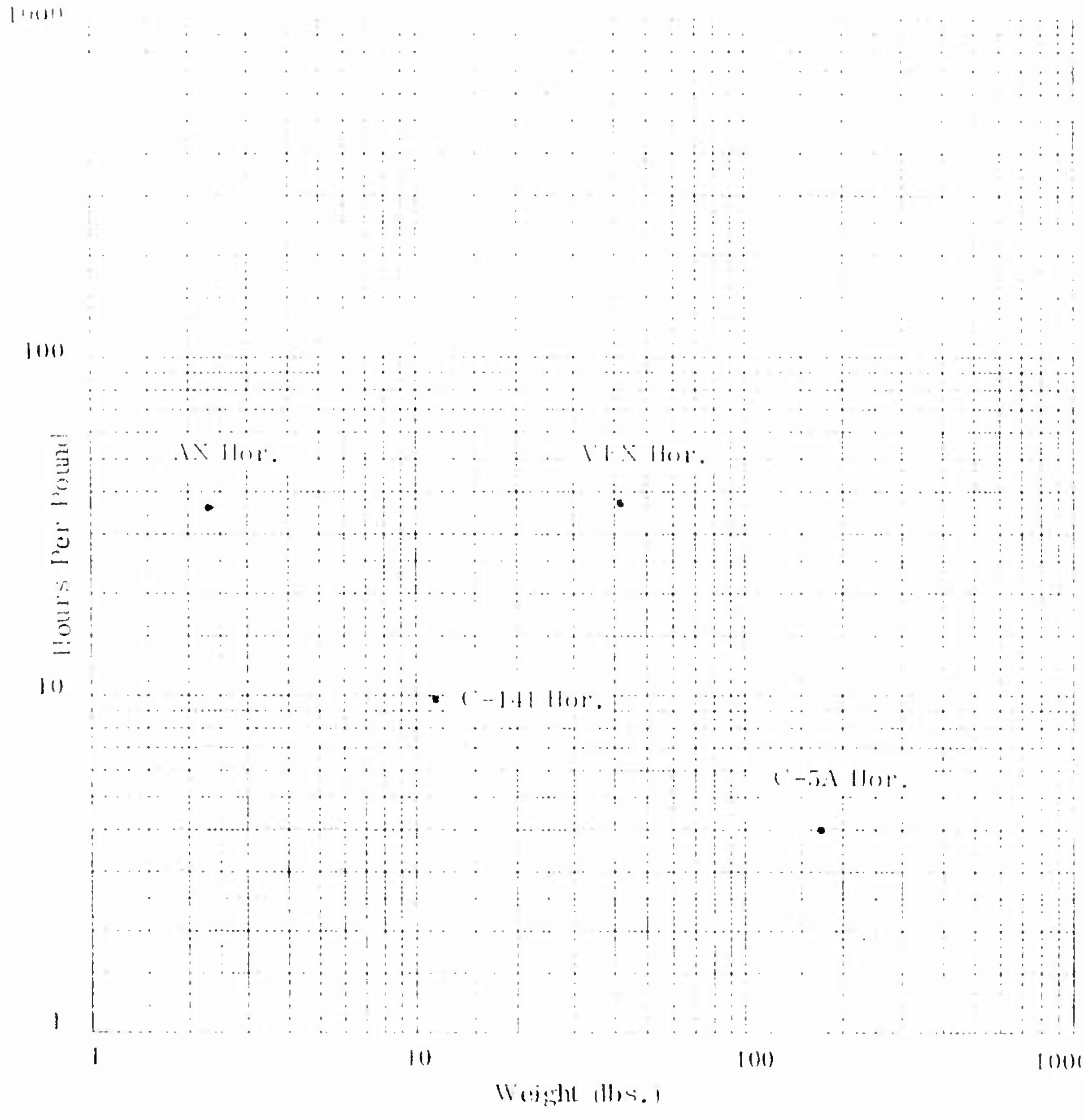

Figure F-62. Tip Subassembly Hours Per Pound Against Weight.

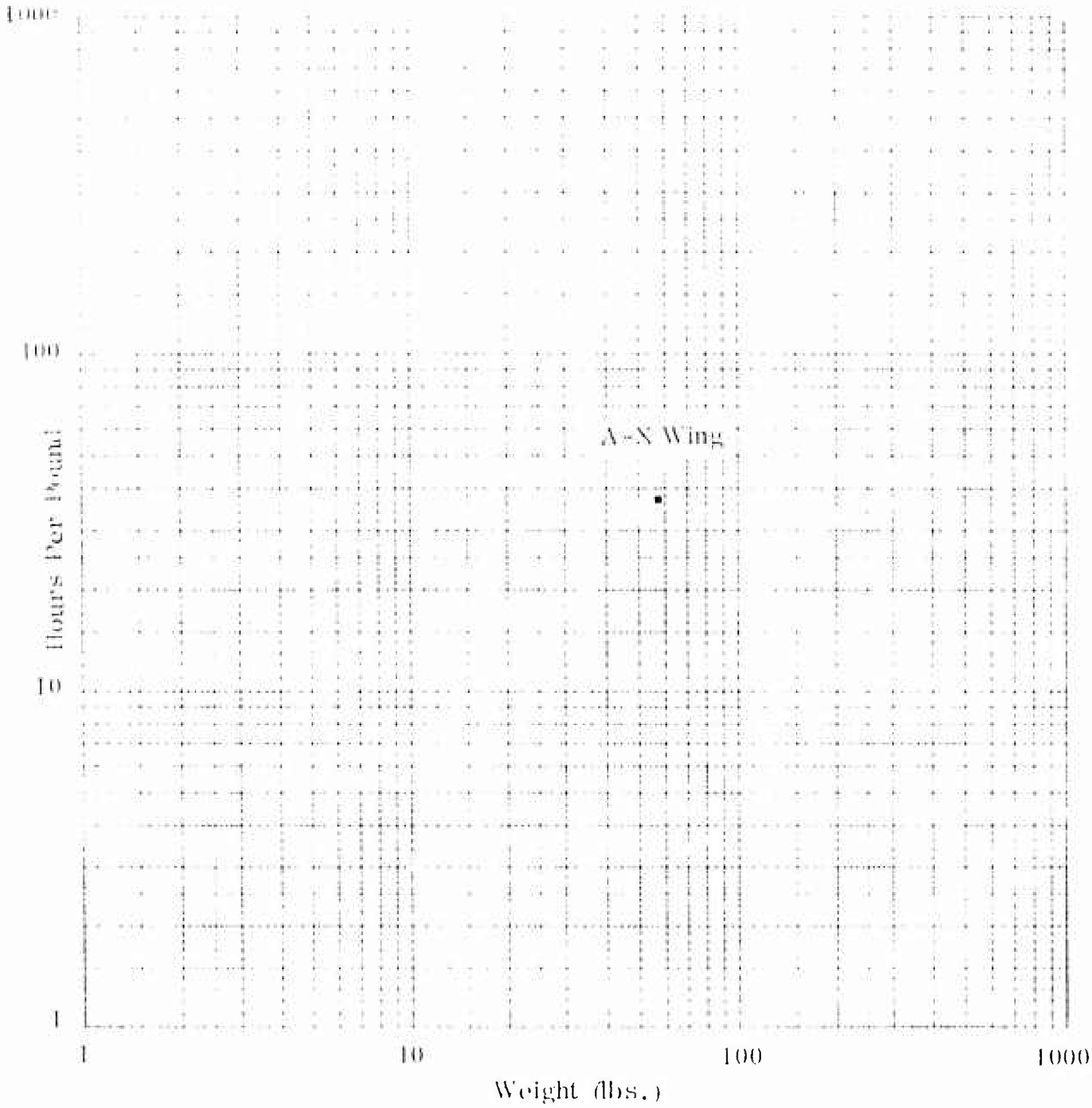

Figure F-63. Spoiler Subassembly Hours Per Pound Against Weight.

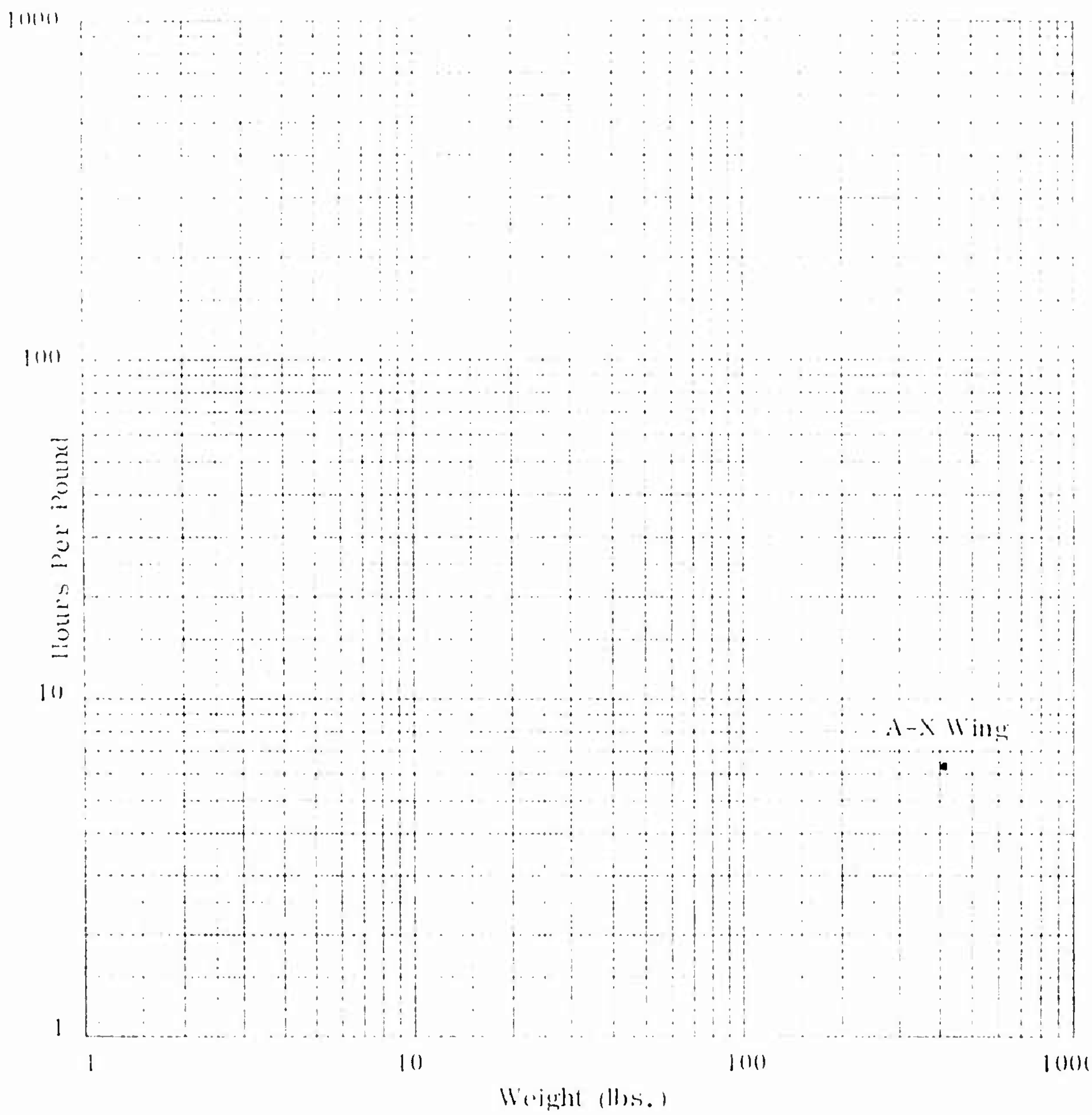

Figure F-64. Flap Subassembly Hours Per Pound Against Weight.

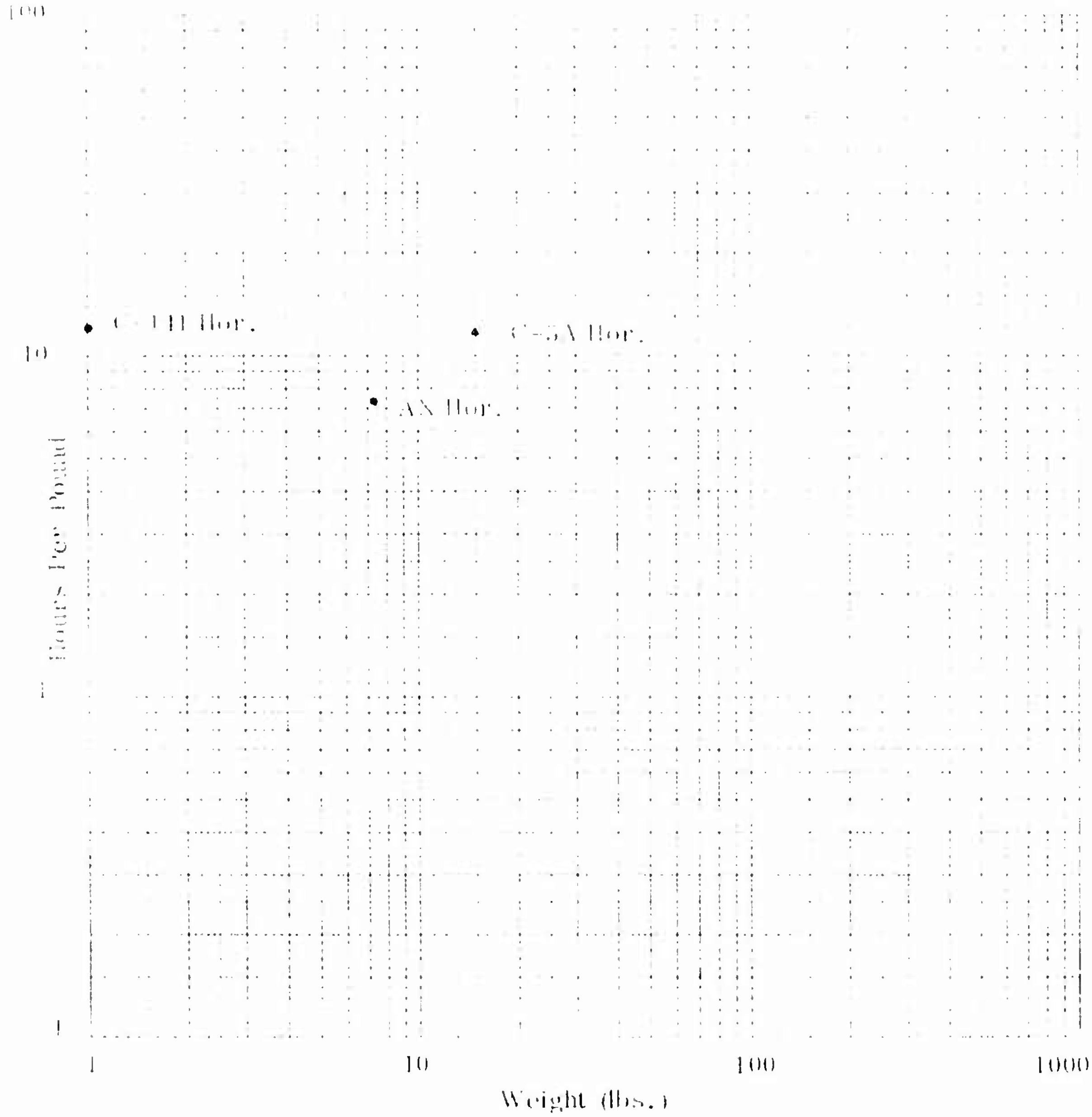

Figure F-65. Attachment Structure Subassembly
Hours Per Pound Against Weight.

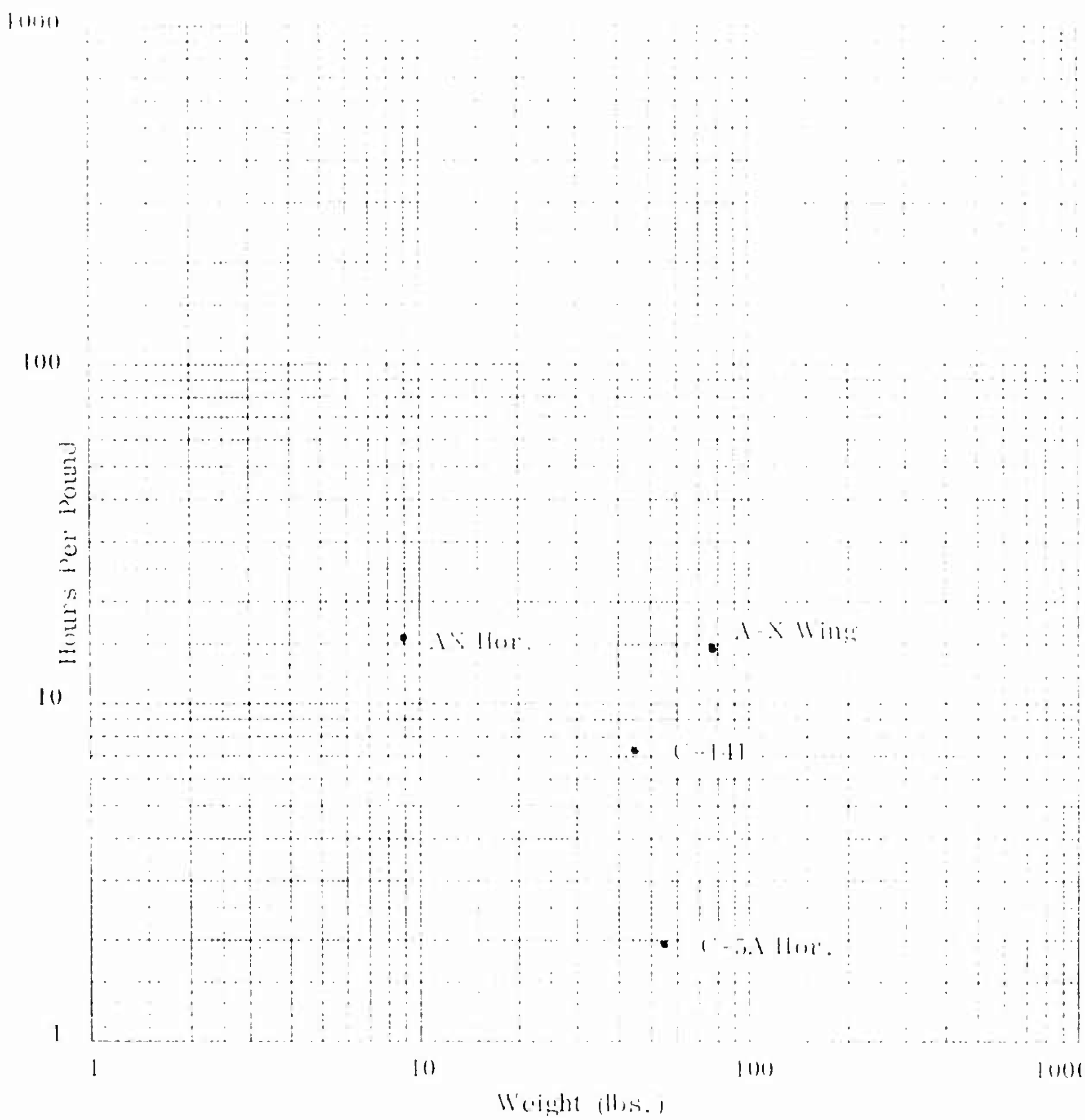

Figure F-66. Access Door Subassembly Hours Per Pound Against Weight.

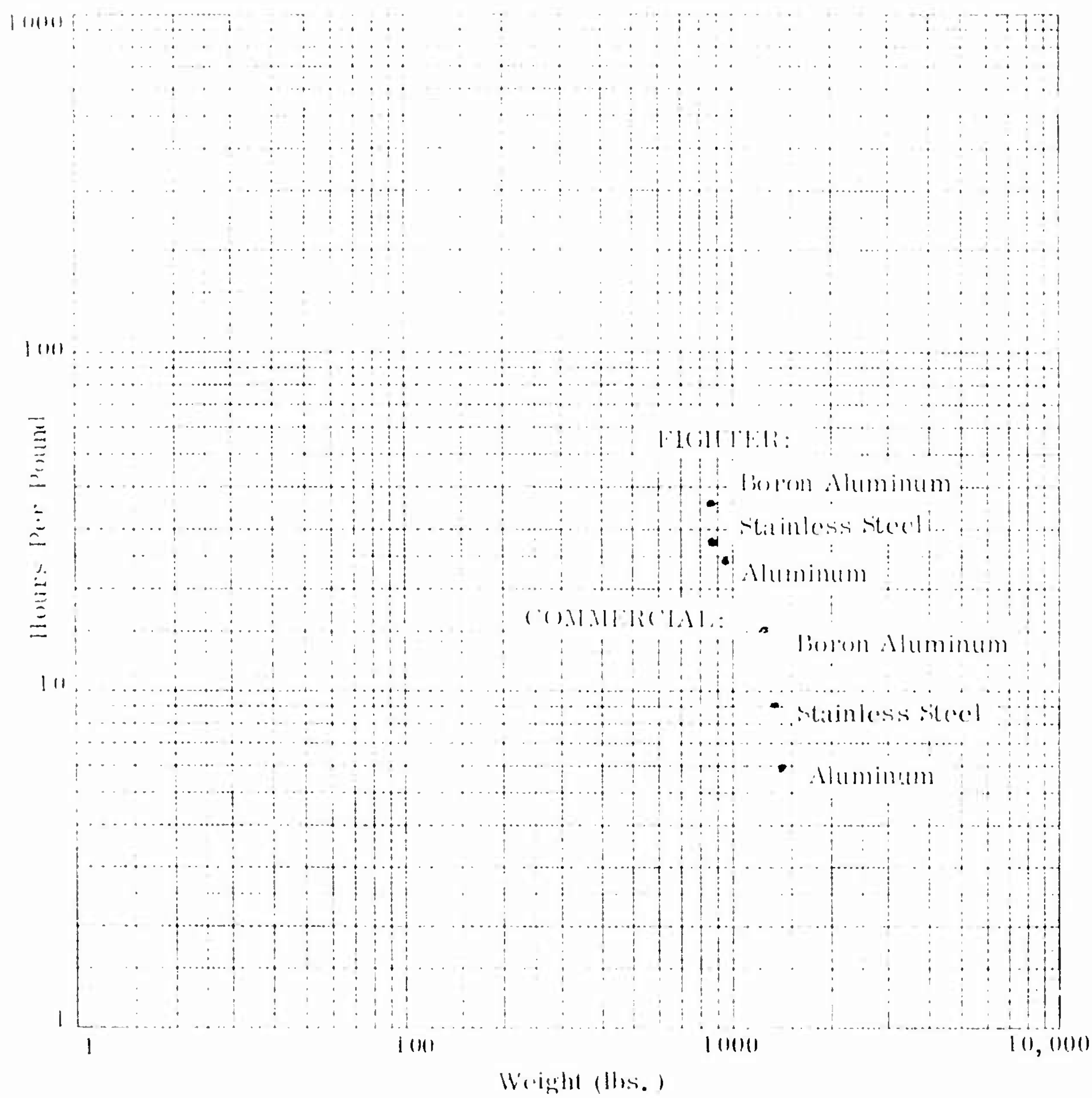

Figure F-67. Wing Mounted Air Induction Subassembly
Hours Per Pound Against Weight.

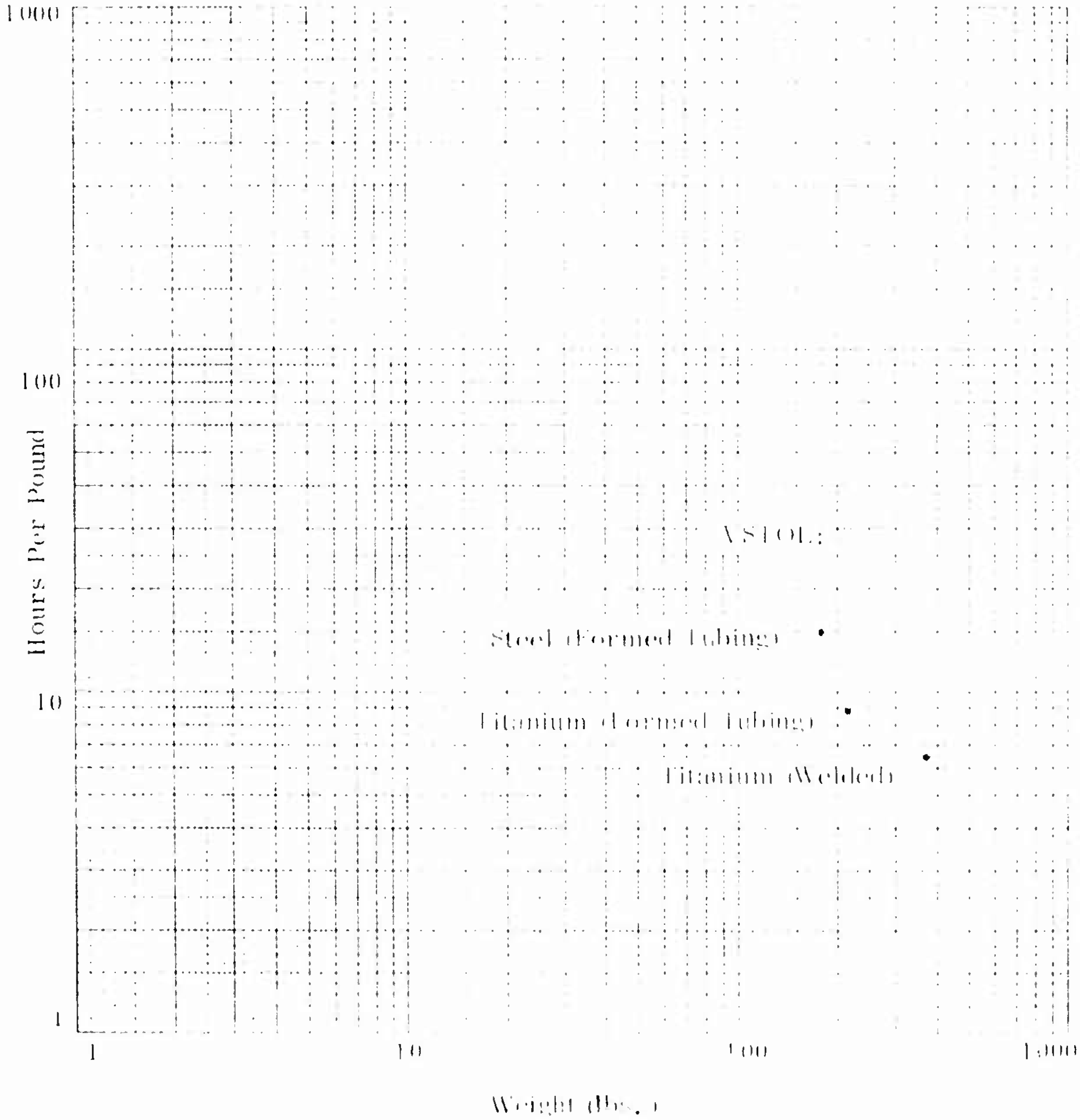

Figure F-68. High Lift Ducting Subassembly
Hours Per Pound Against Weight.

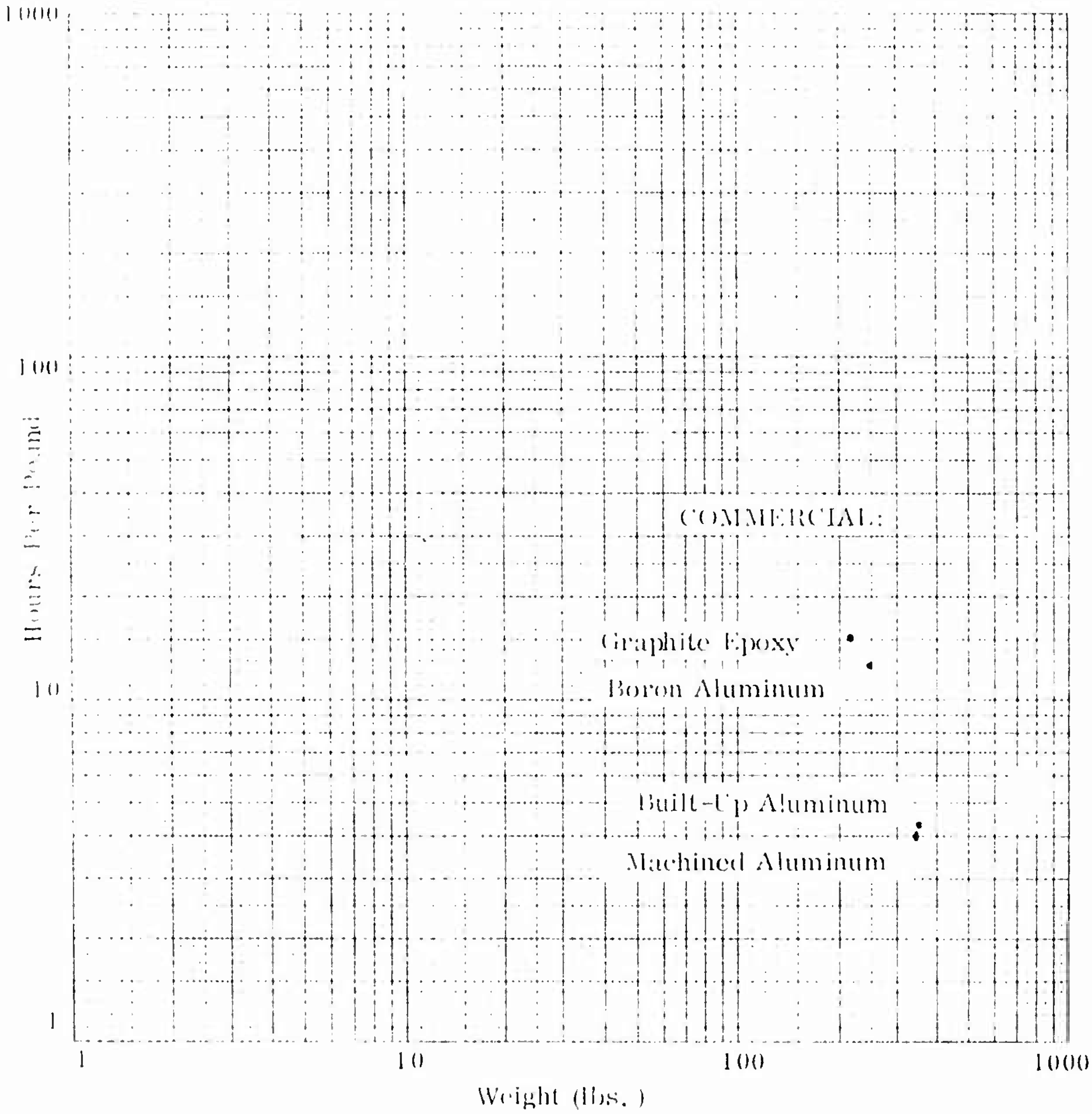

Figure F-69. Slat Subassembly Hours Per Pound Against Weight.

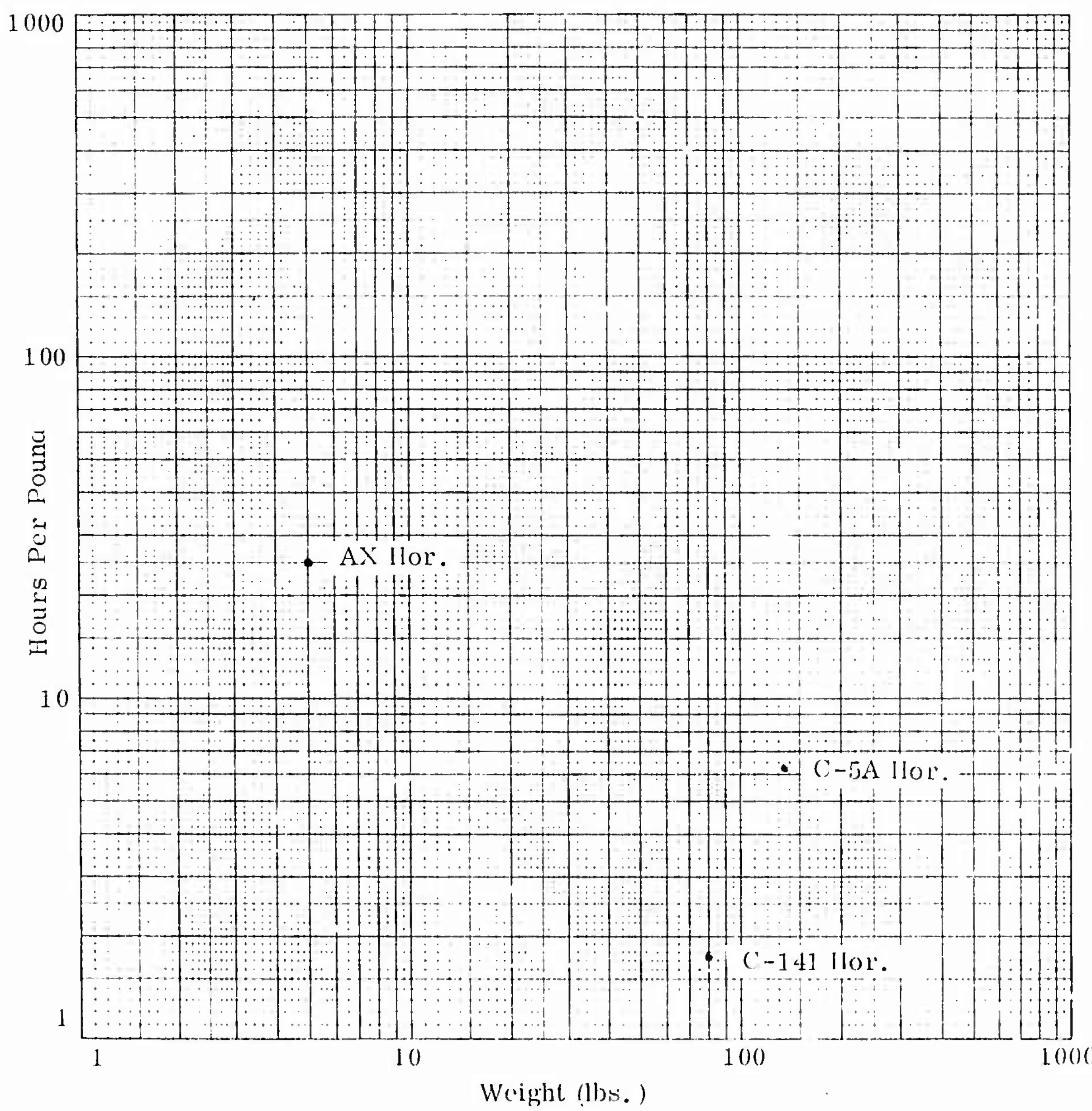

Figure F-70. Hinge, Bracket and Seal Subassembly Hours Per Pound Against Weight.

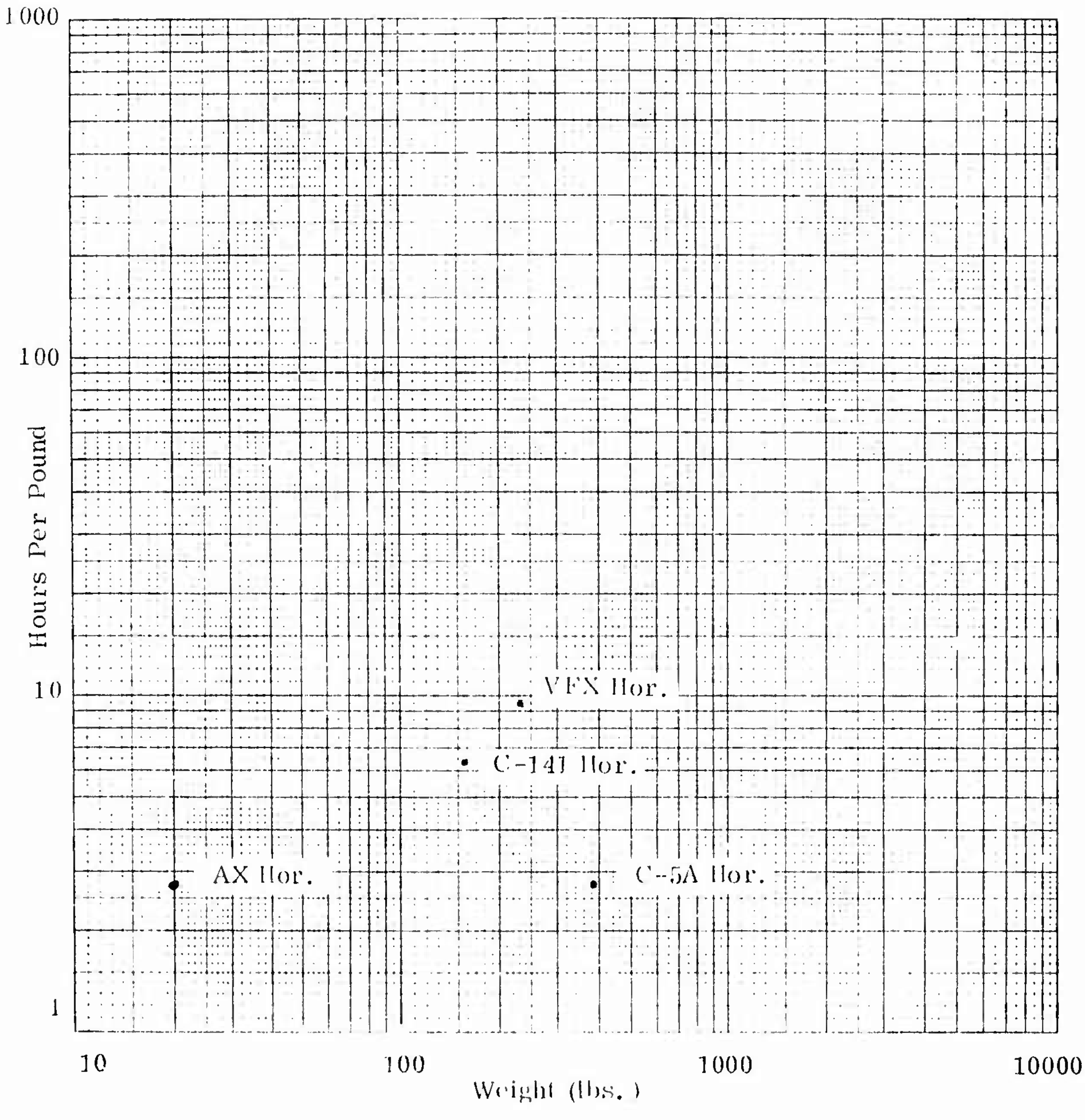

Figure F-71. Pivot and Fold Subassembly
Hours Per Pound Against Weight.

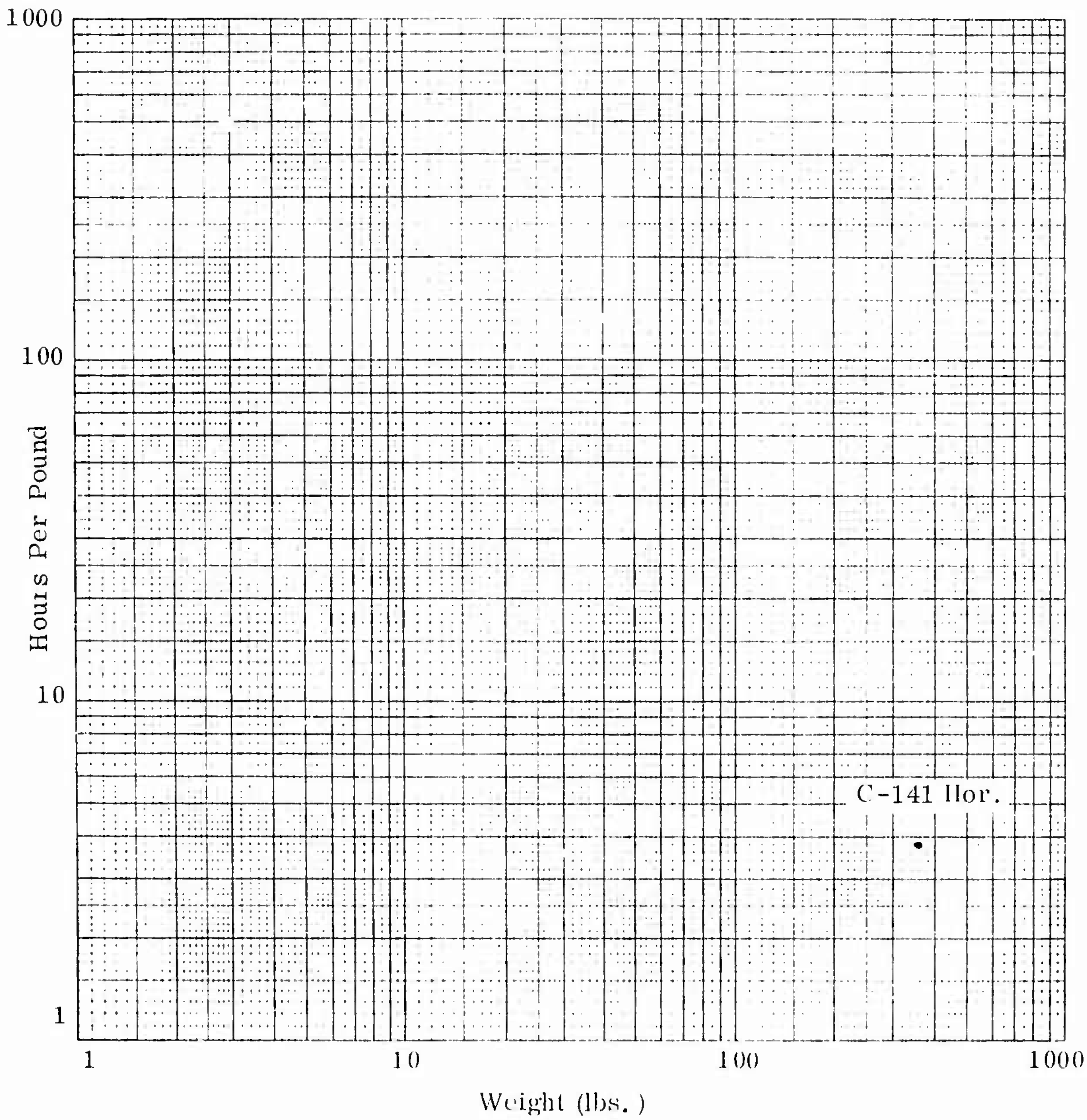

Figure F-72. Horizontal Center Section Subassembly Hours Per Pound Against Weight.

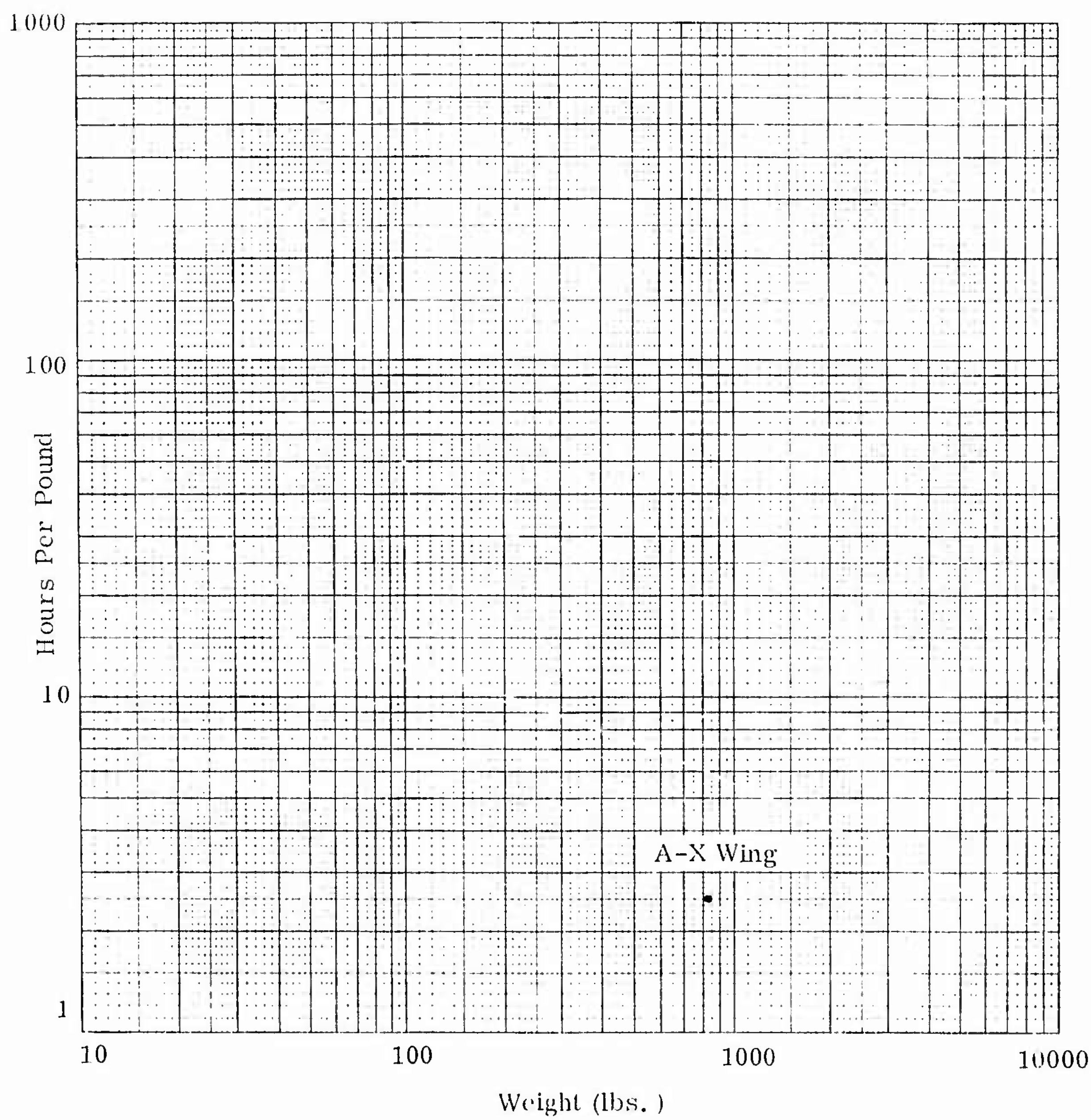

Figure F-73. Subassembly Hours Per Pound Against Weight for Miscellaneous Assemblies.

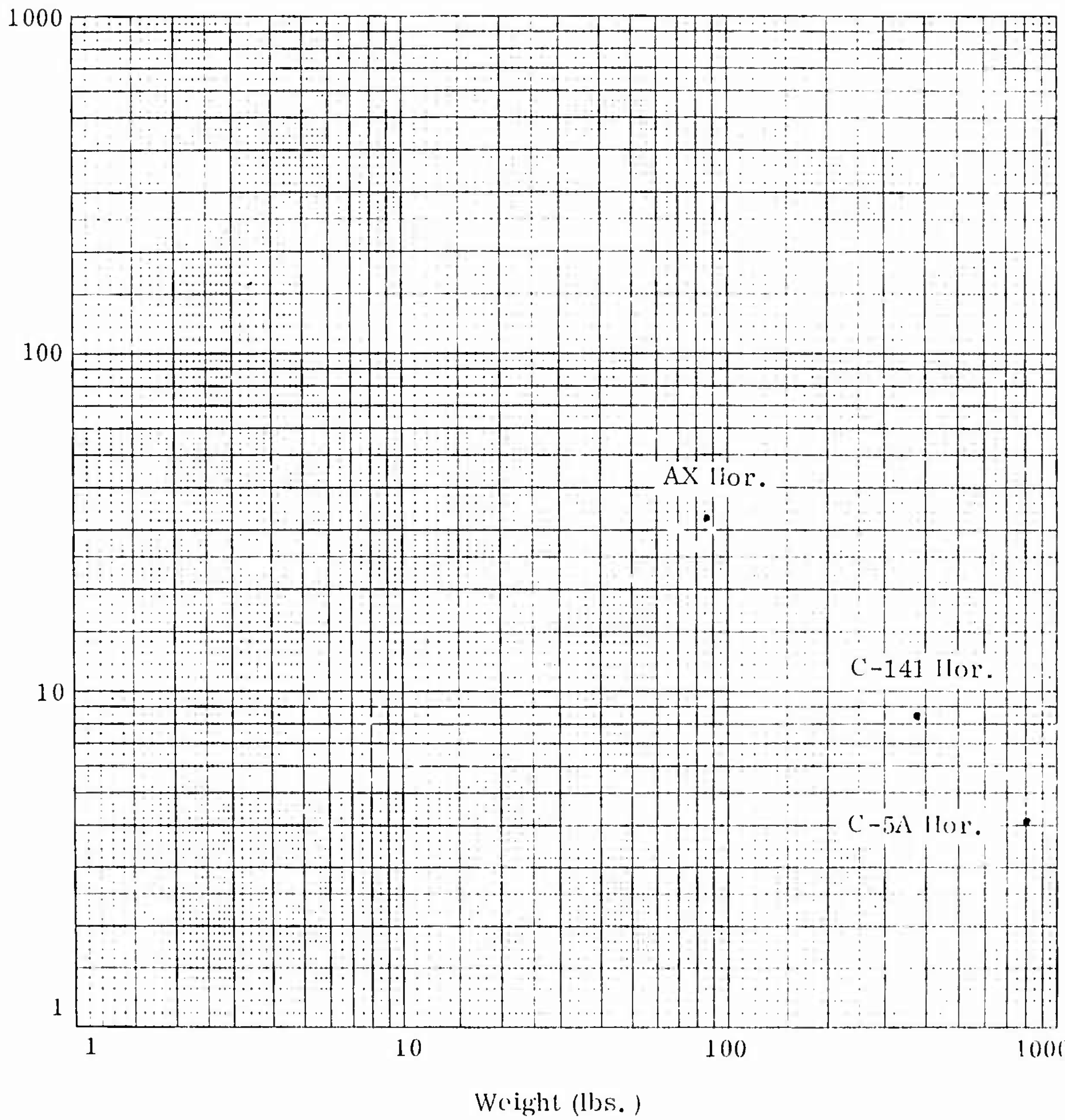

Figure F-74. Elevator Subassembly Hours Per Pound Against Weight.

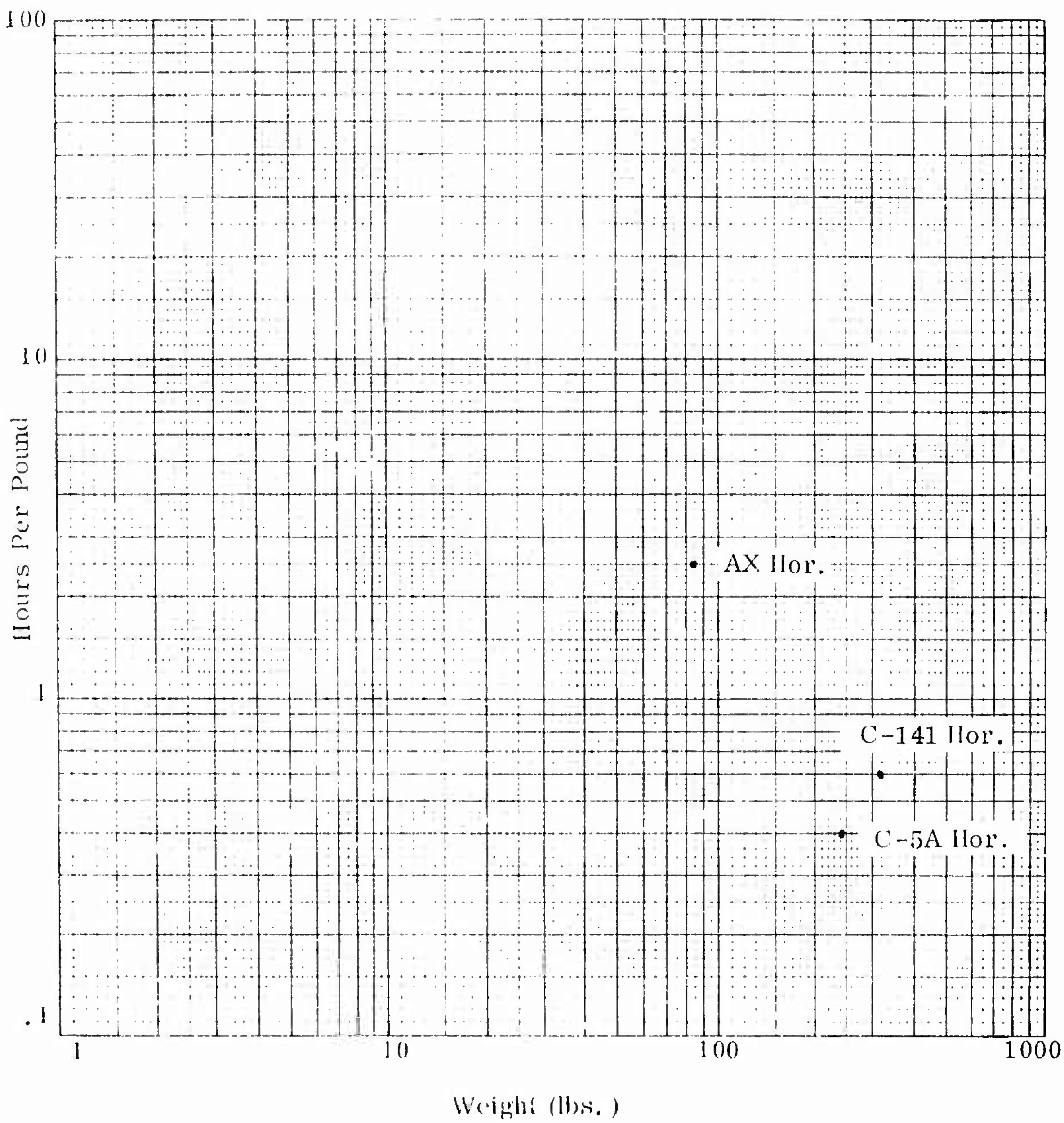

Figure F-75. Balance Weight Subassembly Hours Per Pound Against Weight.

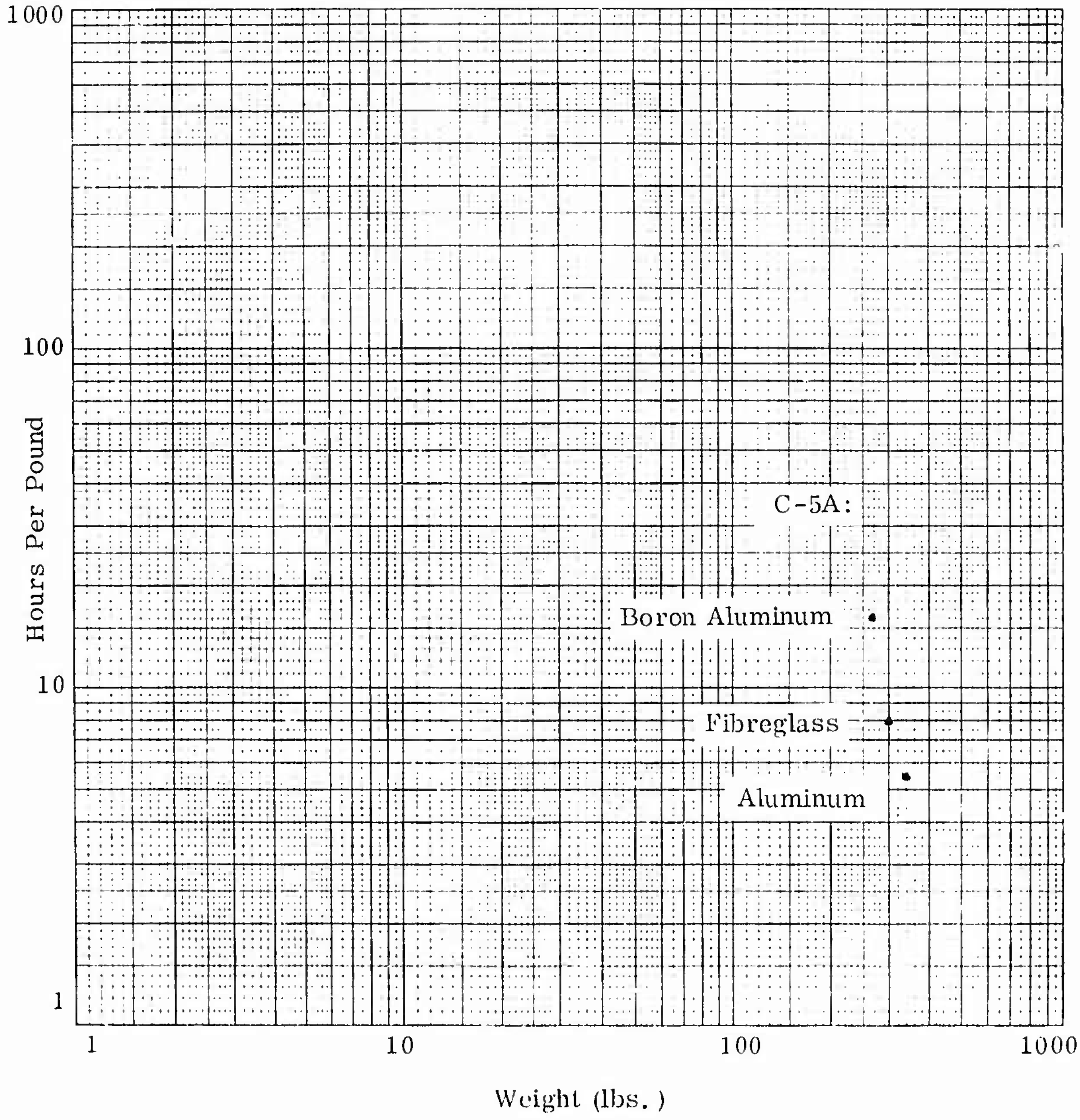

Figure F-76. Rudder Subassembly Hours Per Pound Against Weight.

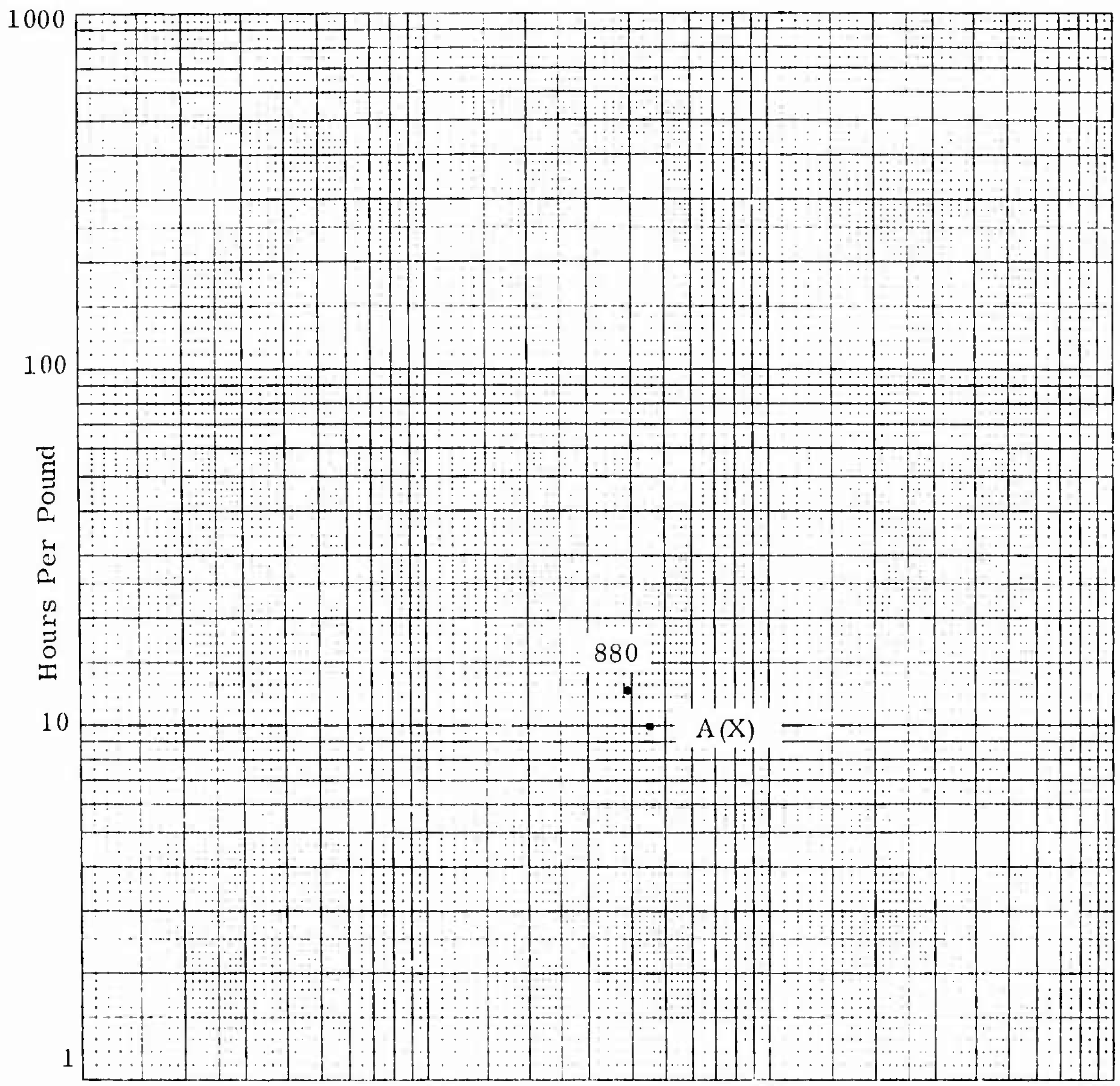

Figure F-77. Cockpit Subassembly Hours Per Pound Against Weight.

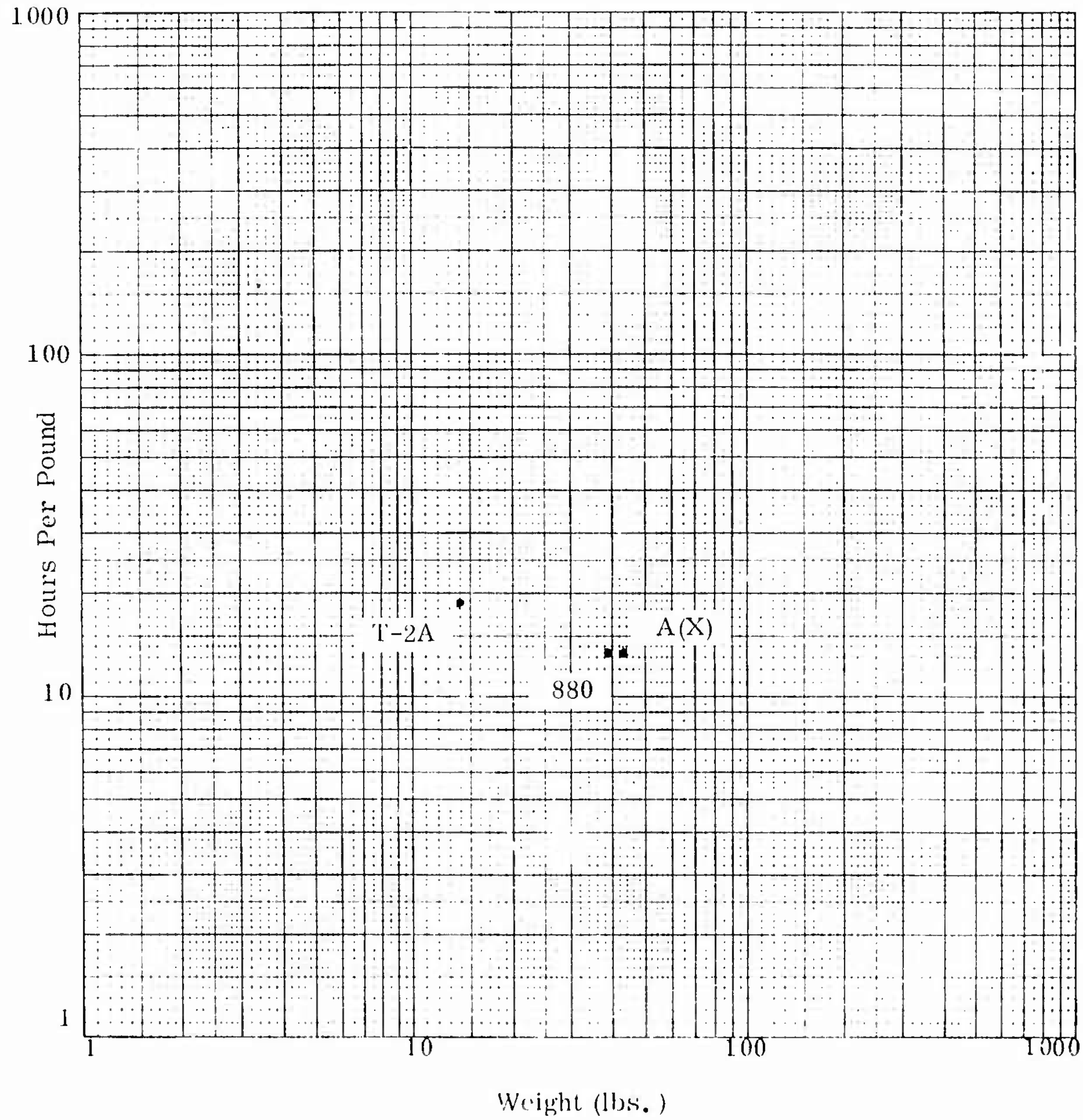

Figure F-78. Nose Landing Gear Door Subassembly
Hours Per Pound Against Weight.

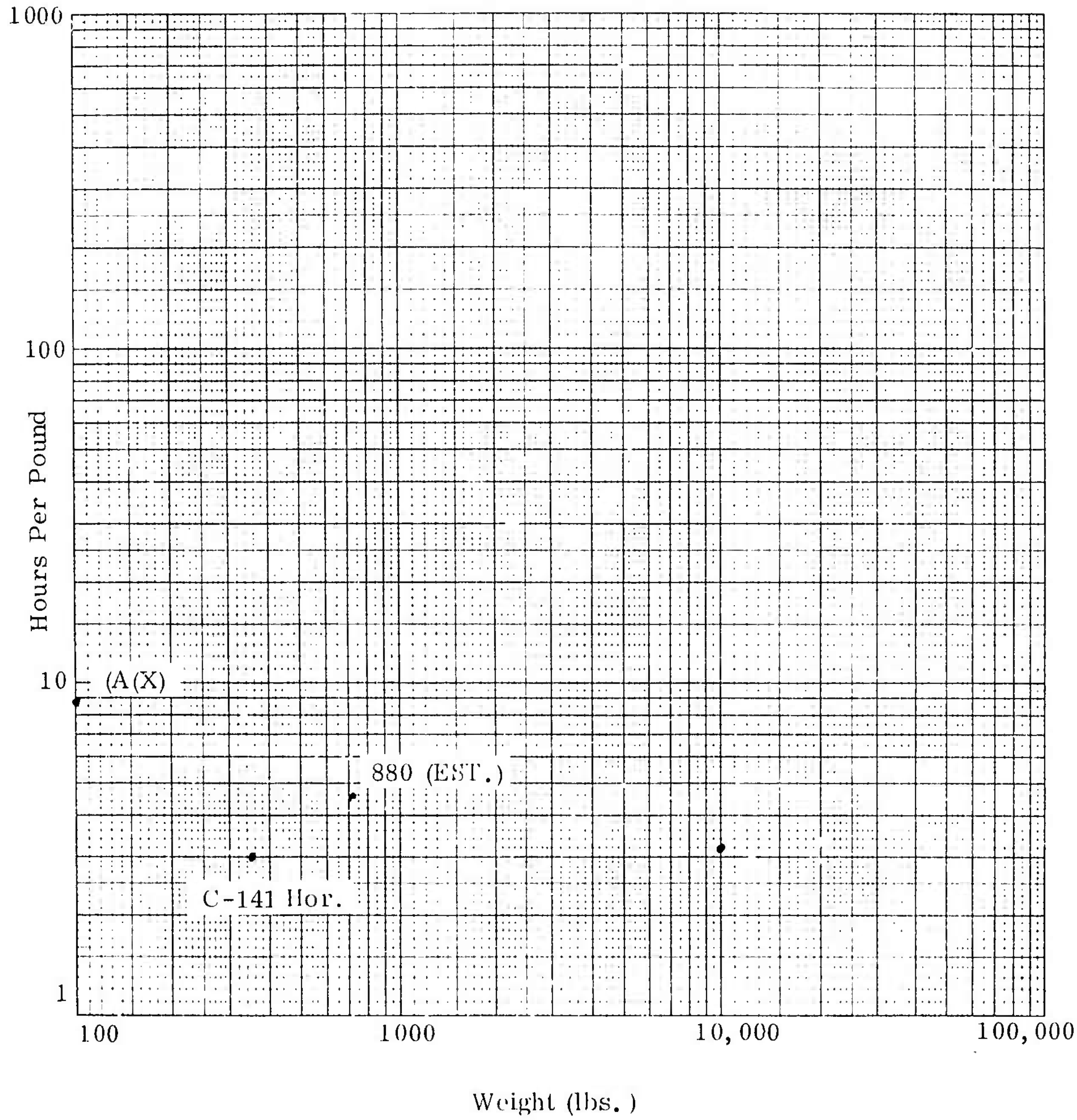

Figure F-79. Wing Reaction Box Subassembly Hours Per Pound Against Weight.

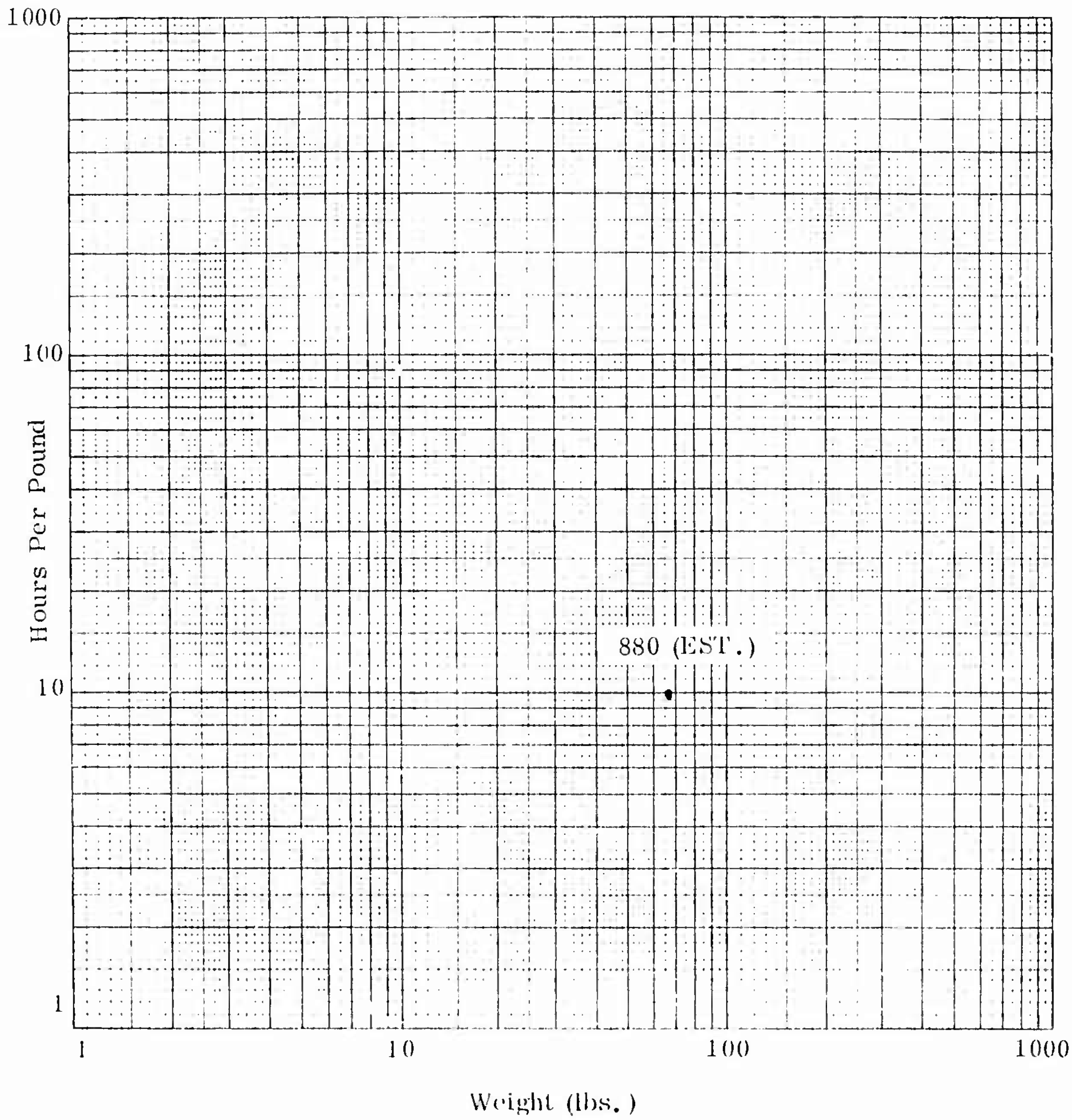

Figure F-80. Tail Attachment Subassembly
Hours Per Pound Against Weight.

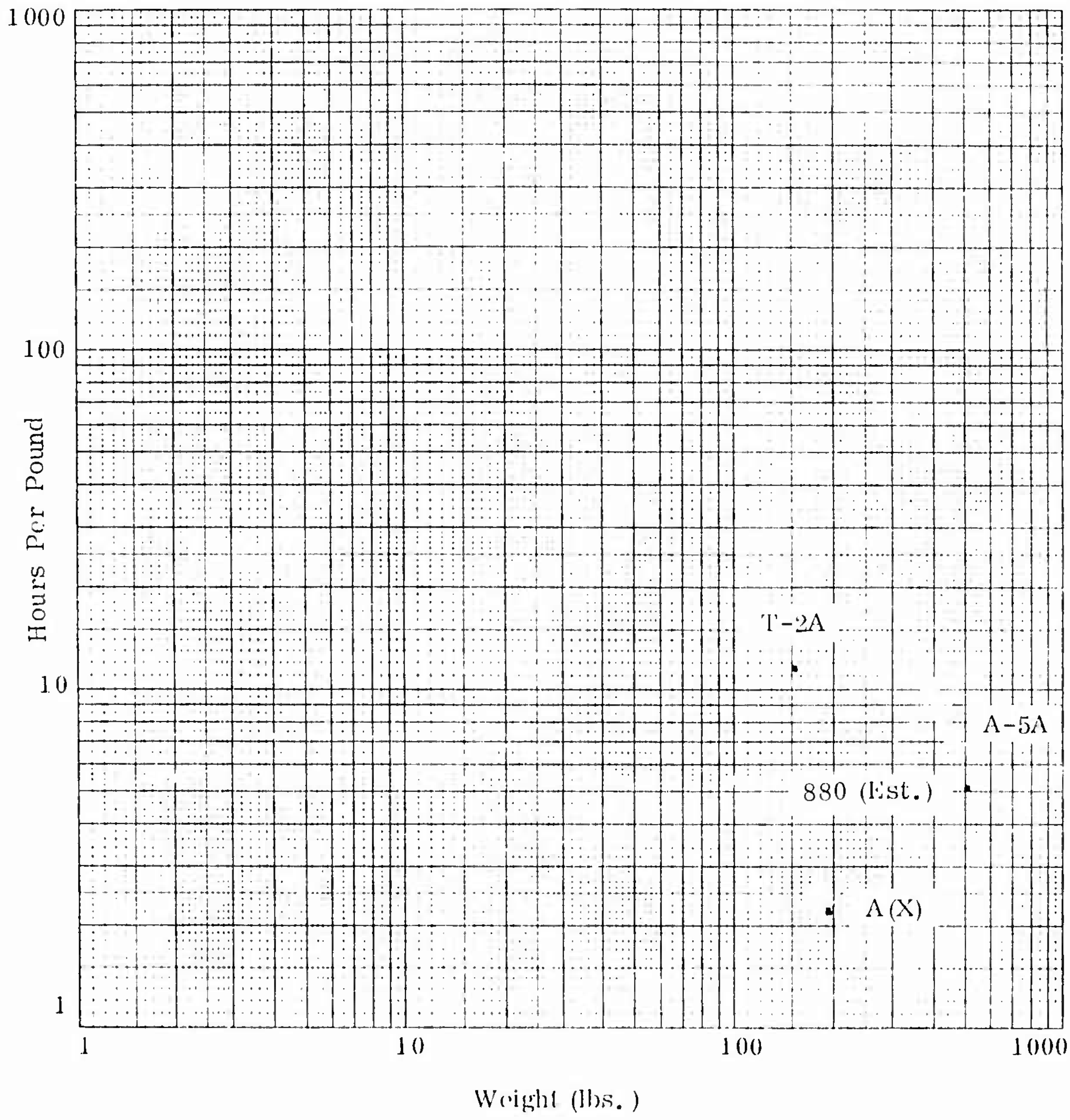

Figure F-81. Canopy Structure Subassembly Hours Per Pound Against Weight.

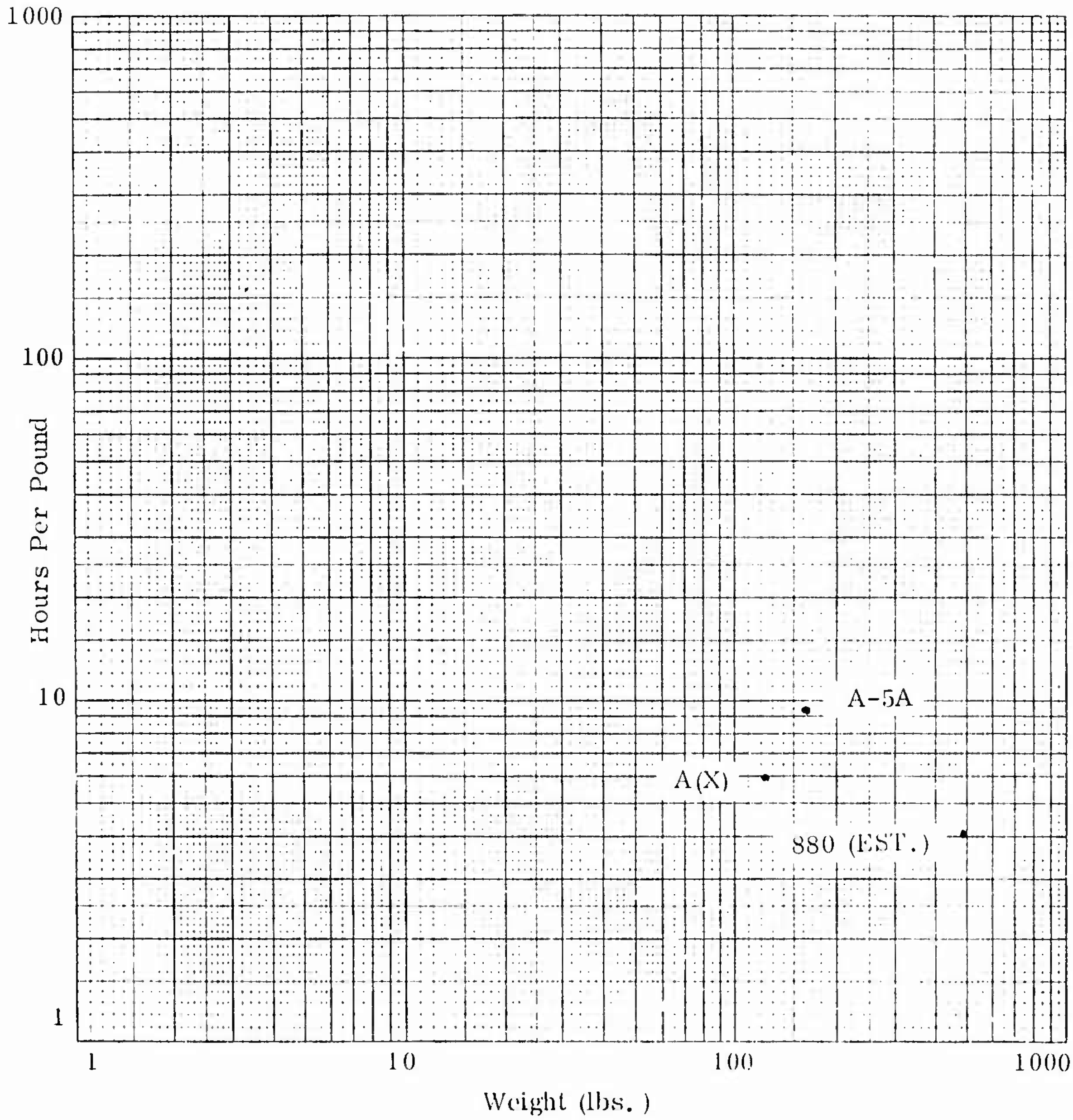

Figure F-82. Main Landing Gear Door Subassembly Hours Per Pound Against Weight.

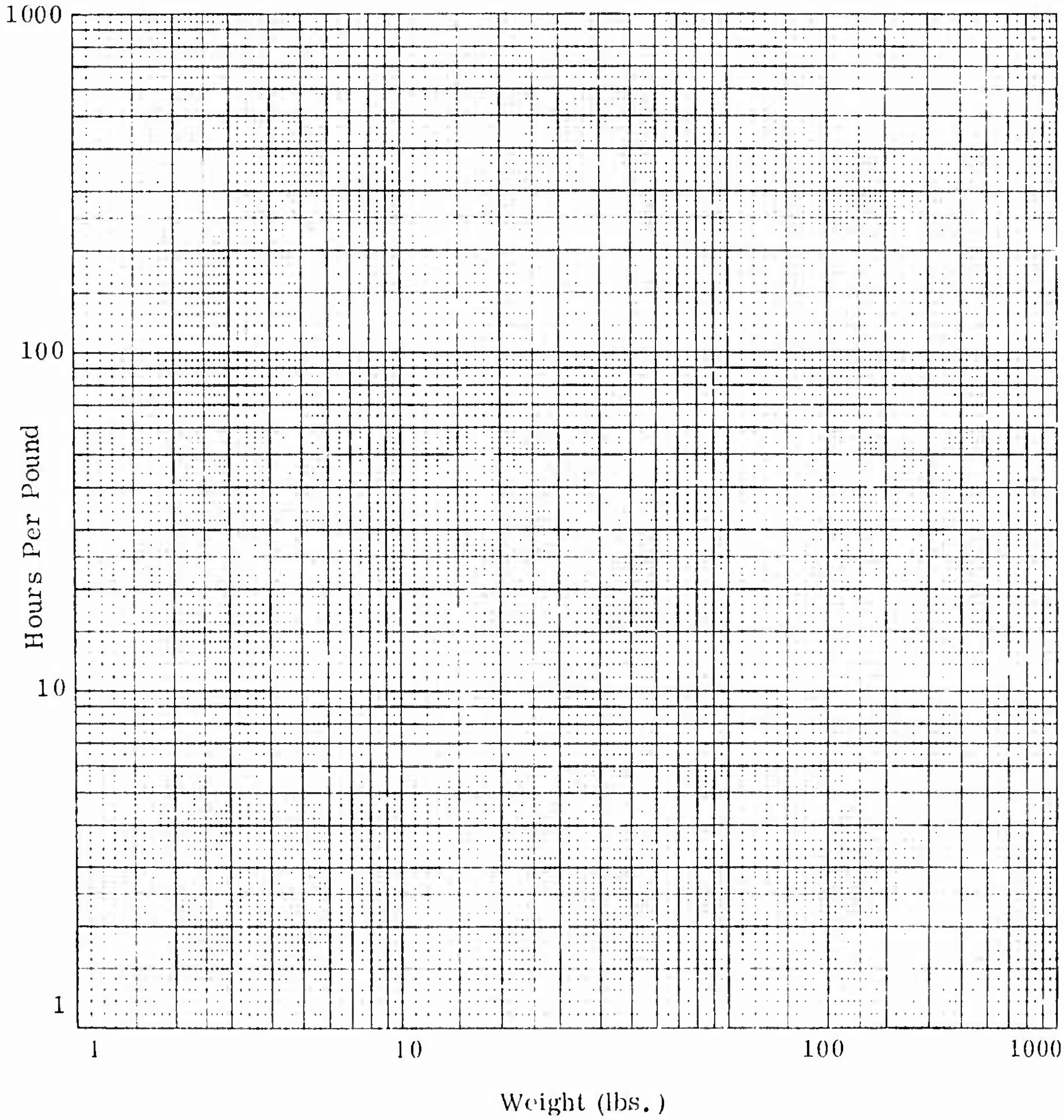

Figure F-83. Fuel Provisions Subassembly Hours Per Pound Against Weight.

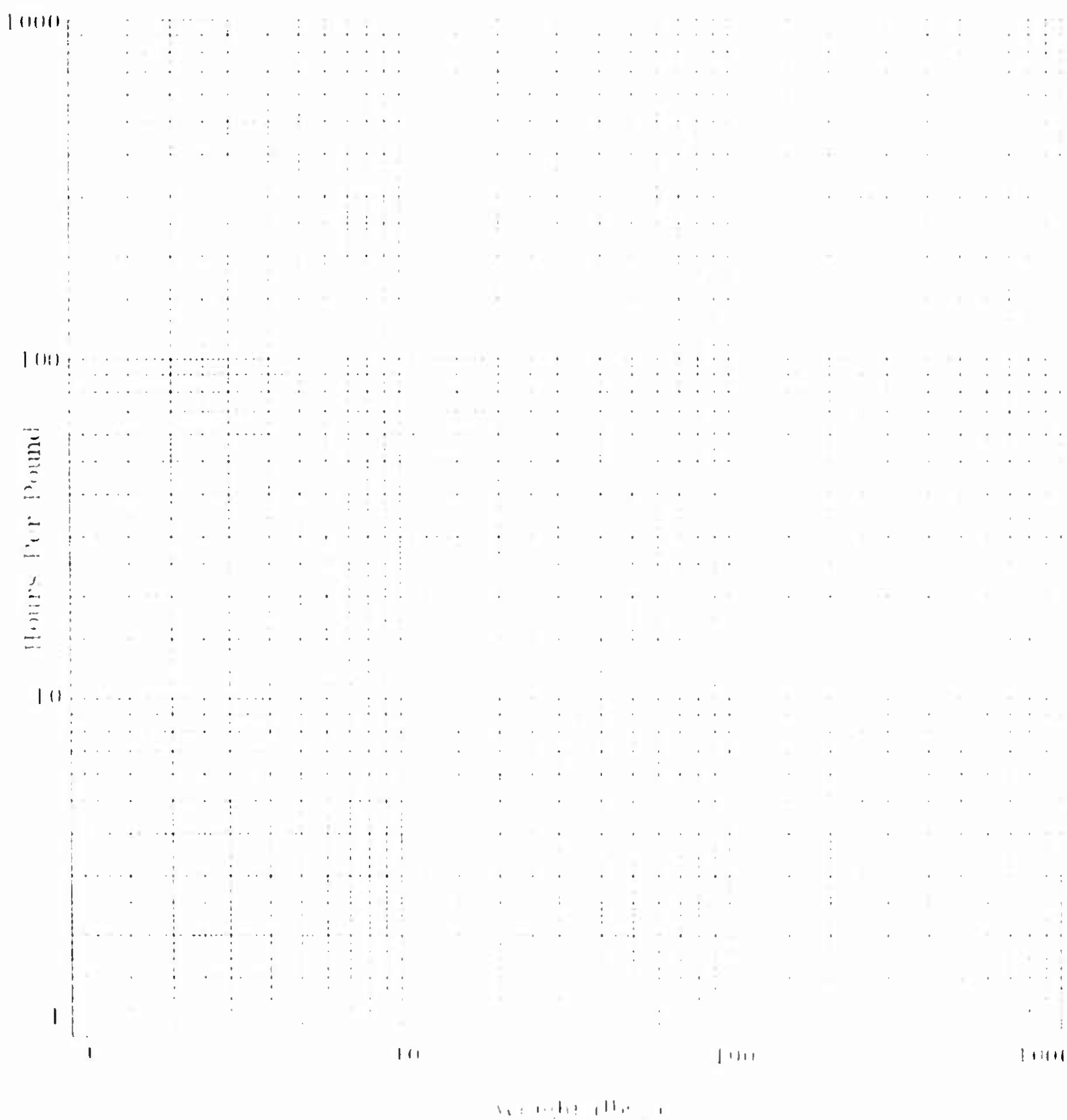

Figure F-1. Engine Provisions Subassembly Hours Per Pound Against Weight.

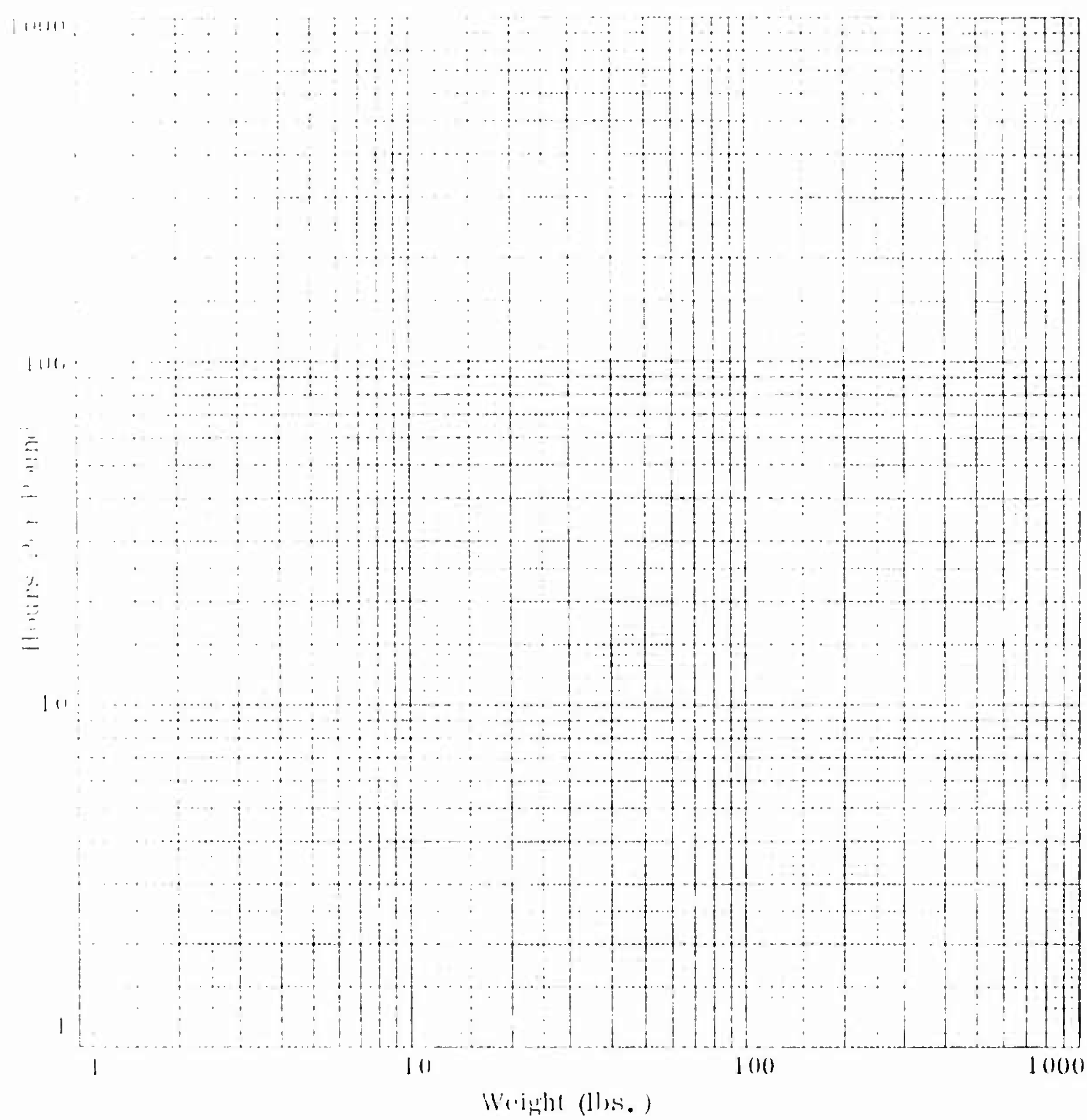

Figure F-85. Duct Provisions Subassembly Hours
Per Pound Against Weight.

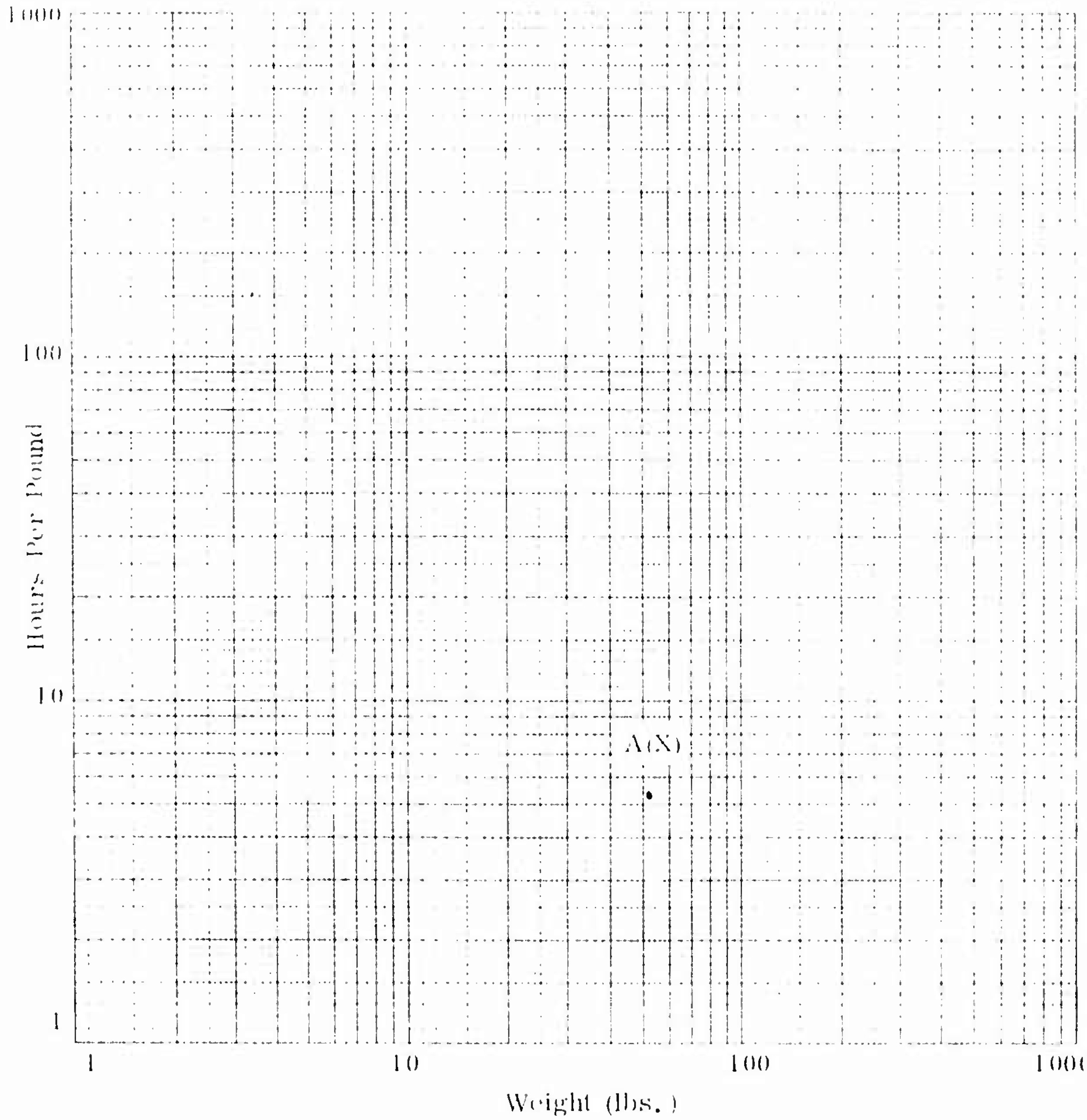

Figure F-86. Stores Provision Subassembly Hours Per Pound Against Weight.

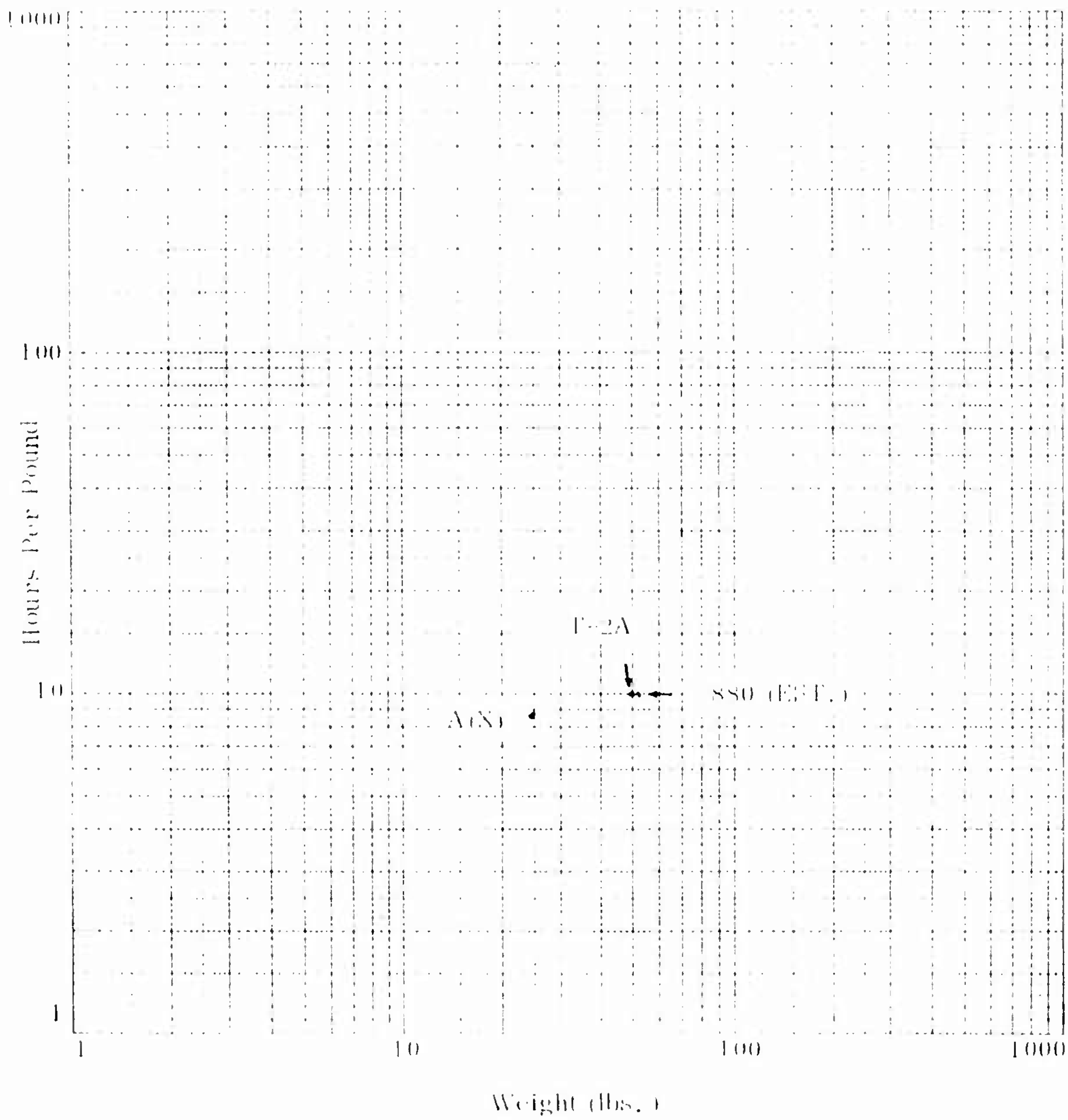

Figure F-87. Speed Brakes Subassembly Hours Per Pound Against Weight.

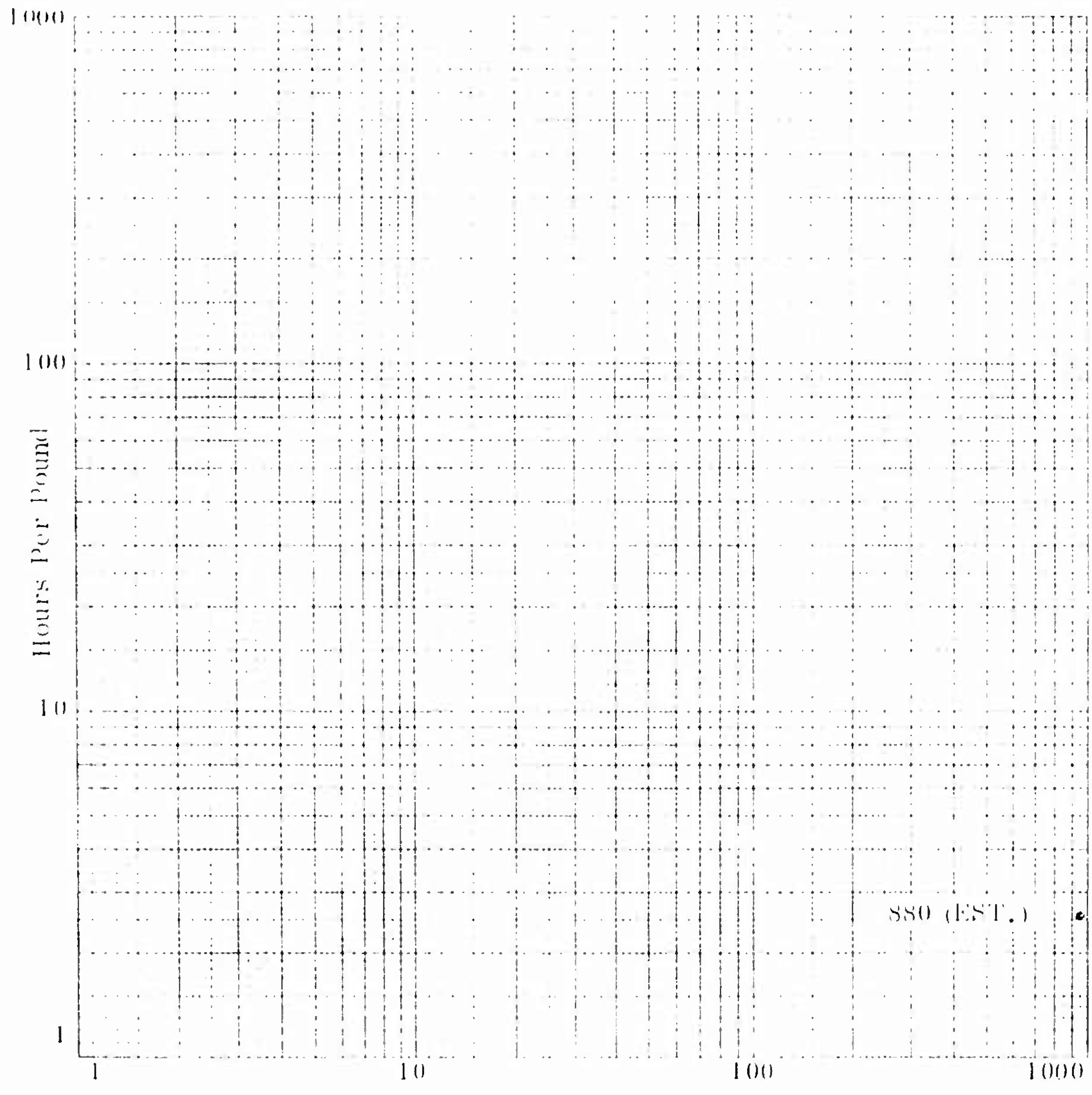

Figure F-88. Cabin Flooring and Supports Subassembly Hours Per Pound Against Weight.

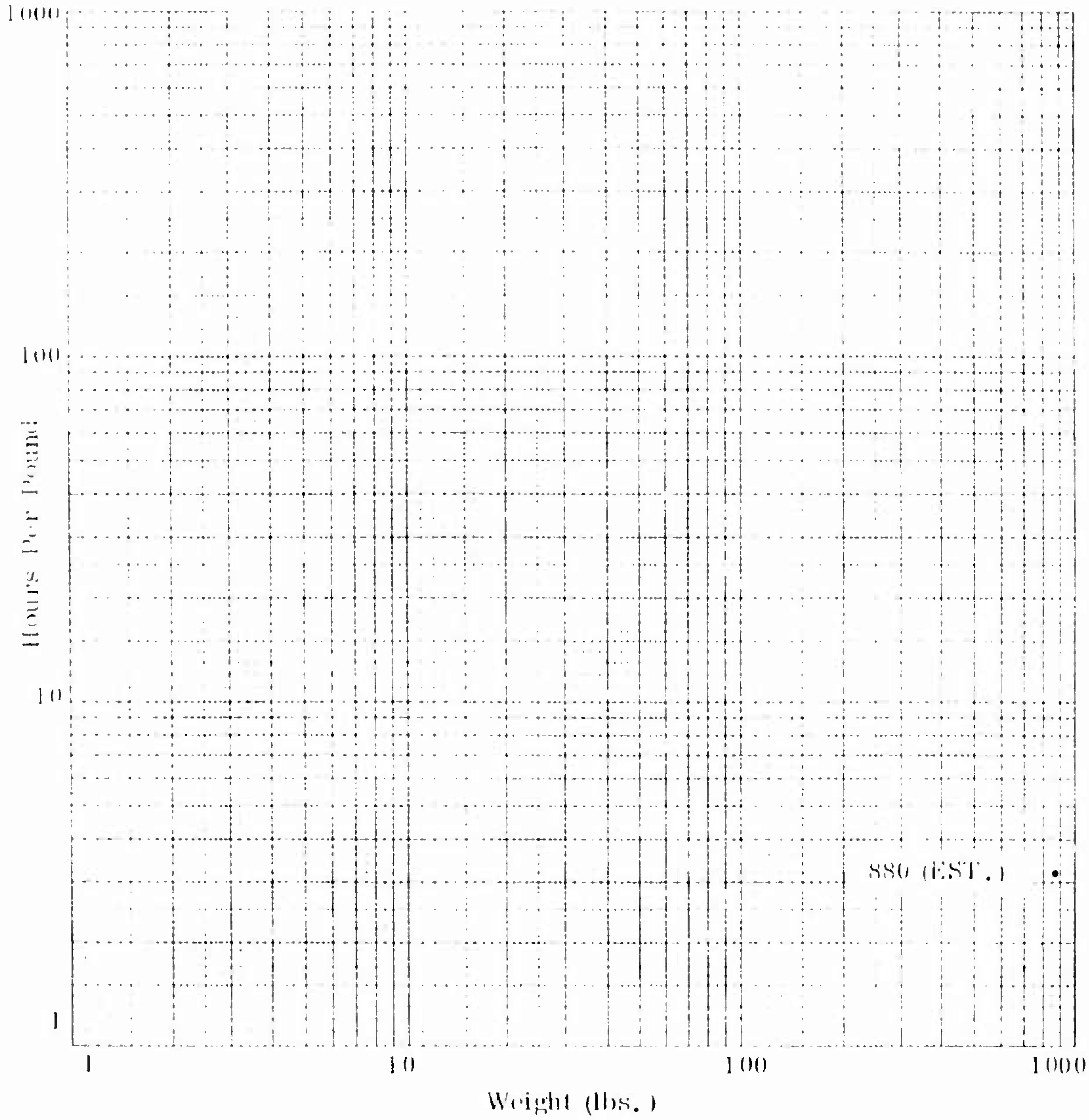

Figure F-89. Window and Window Frame Subassembly Hours Per Pound Against Weight.

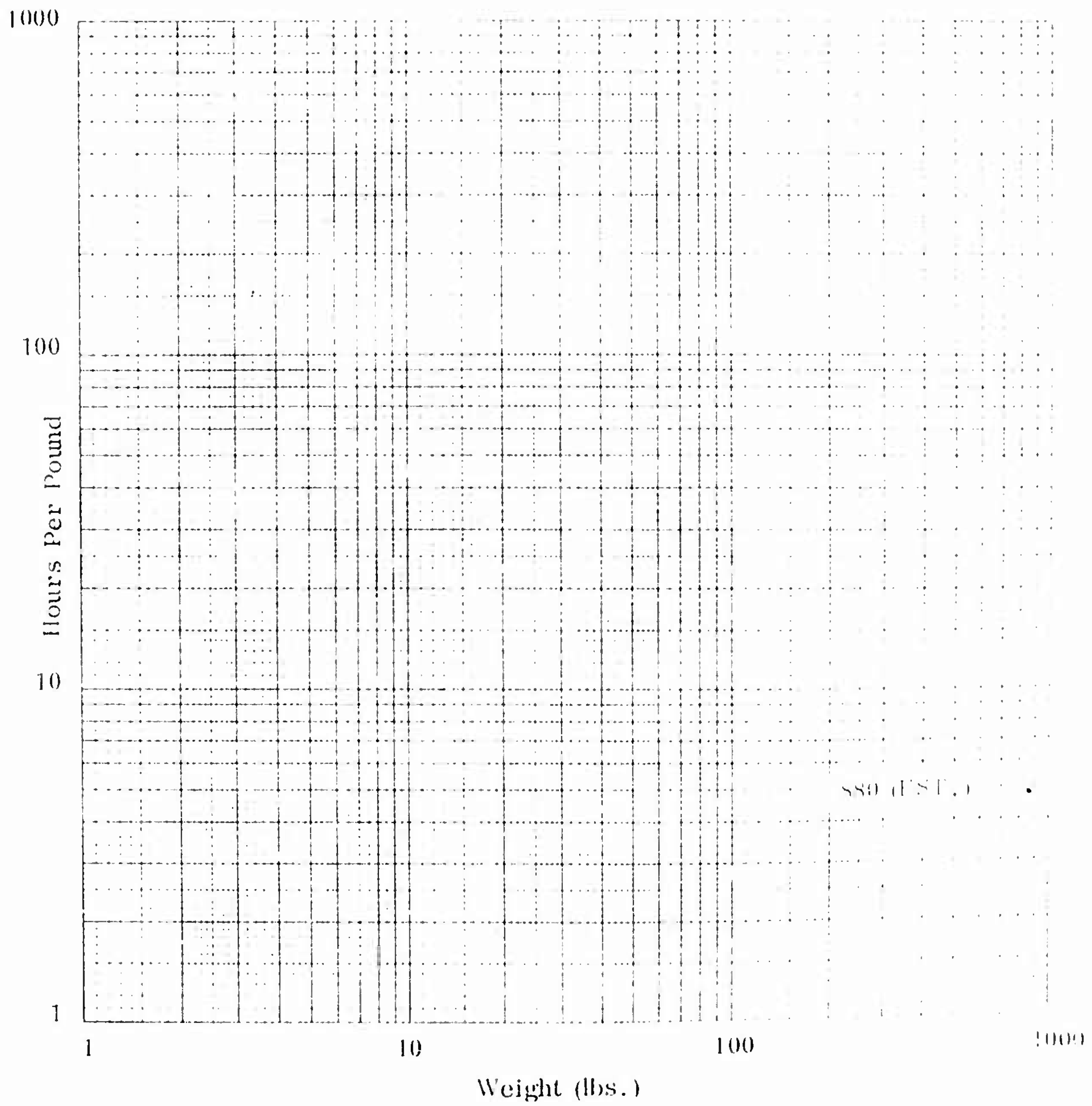

Figure F-90. Door and Door Frames Subassembly
Hours Per Pound Against Weight.

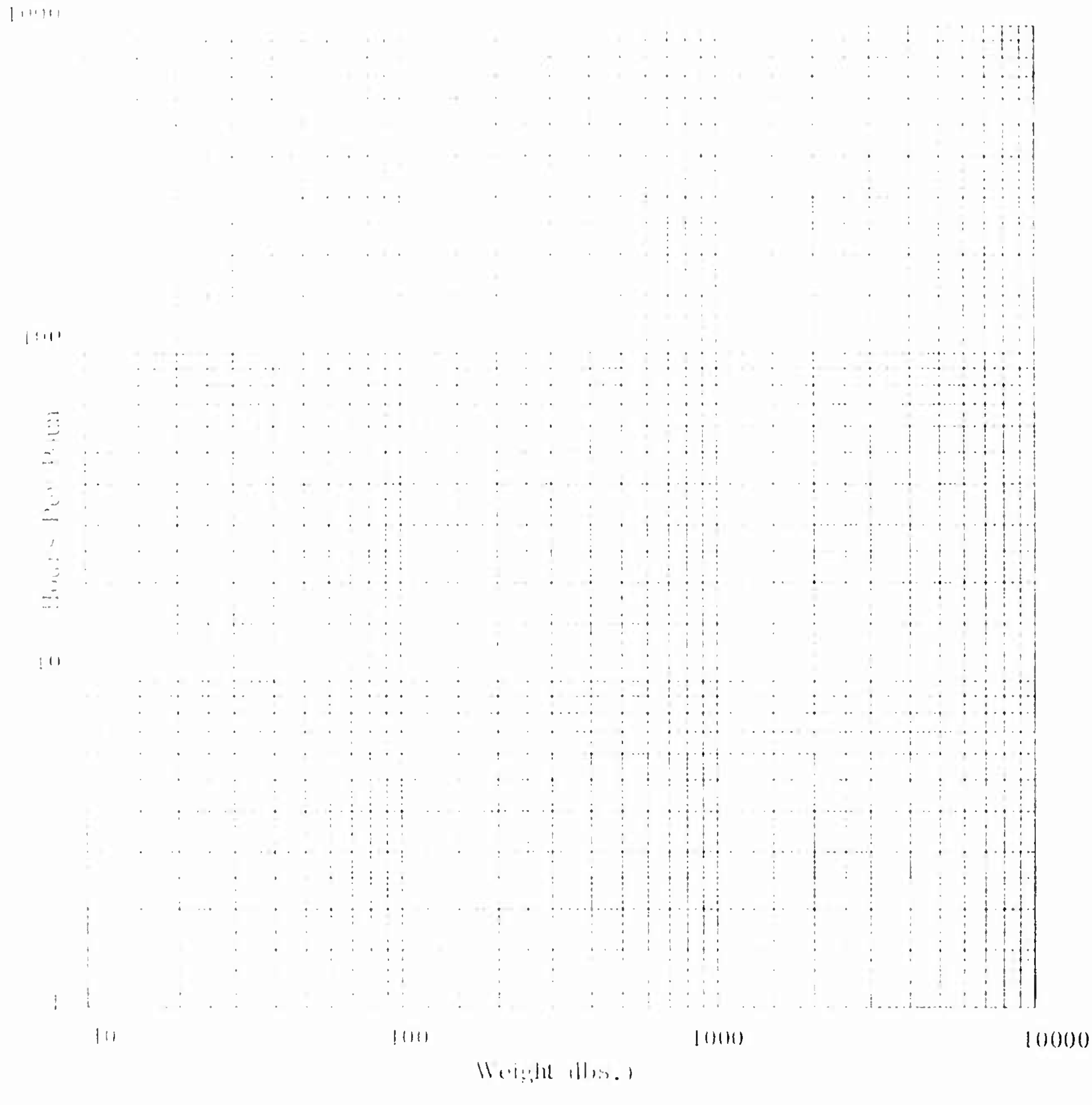

Figure F-91. Nacelle Structure Subassembly
Hours Per Pound Against Weight.

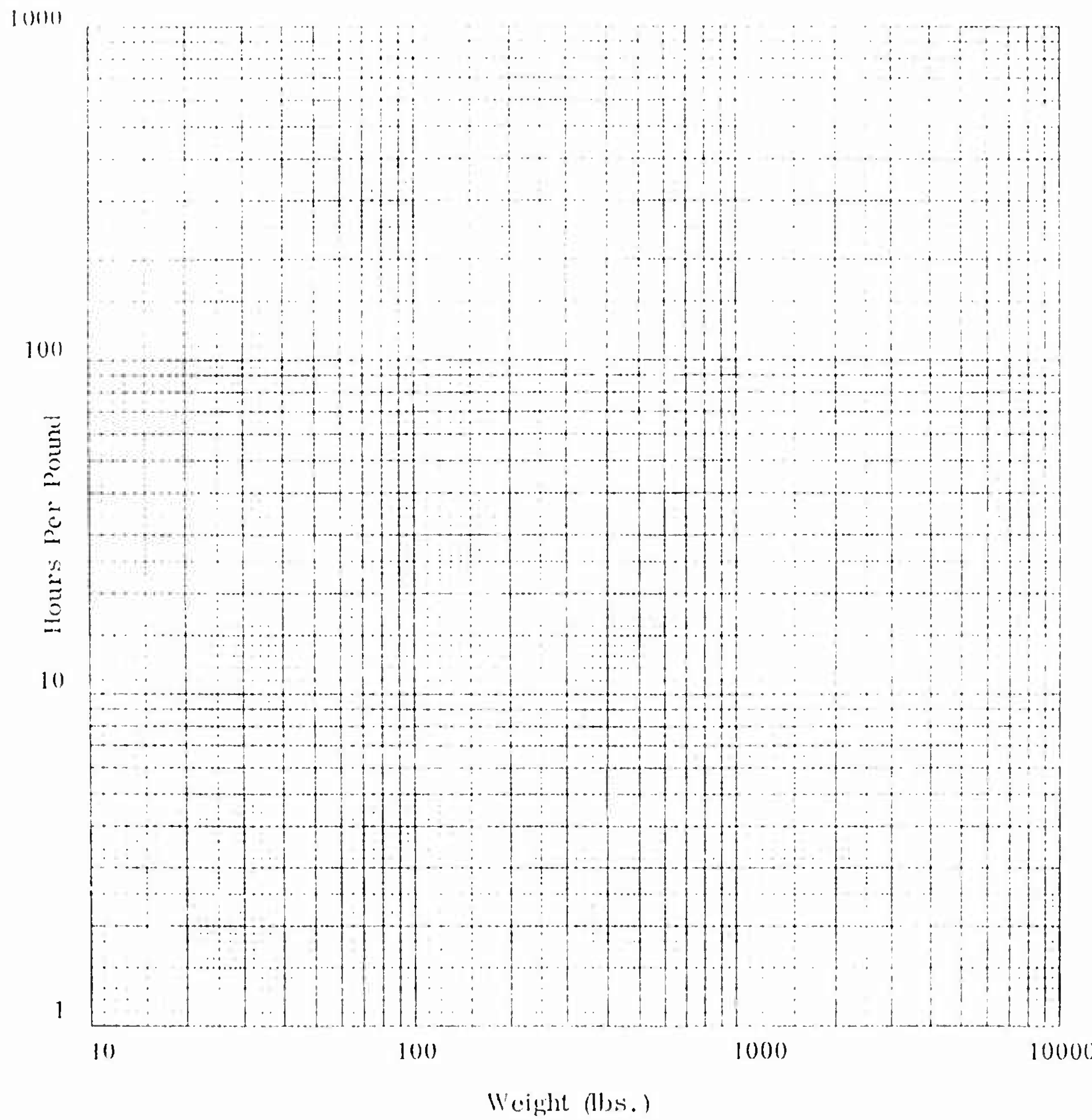

Figure F-92. Nacelles - Pylons Subassembly
Hours Per Pound Against Weight.

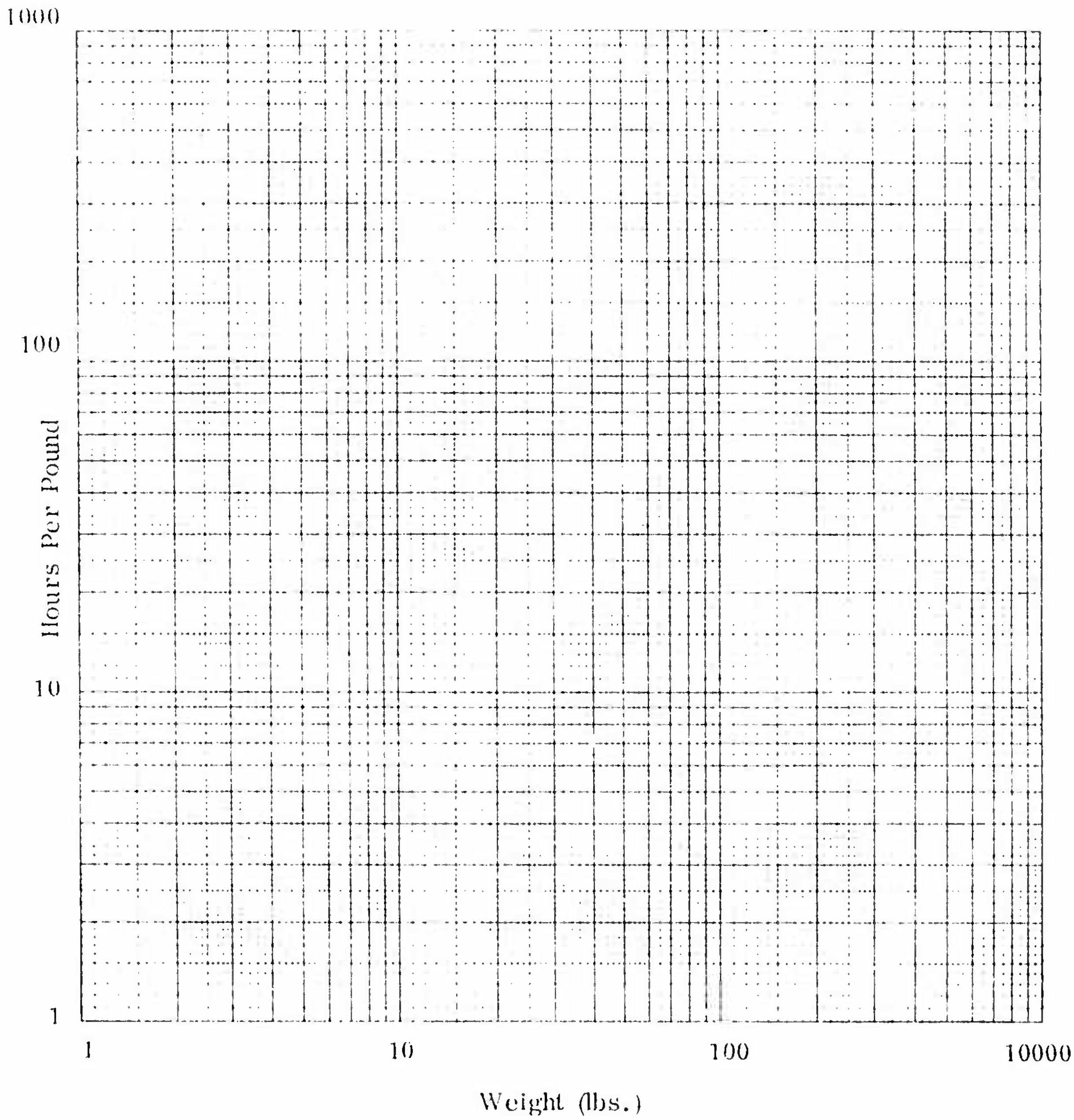

Figure F-93. Nacelles - Main Landing Gear Door Subassembly Hours Per Pound Against Weight.

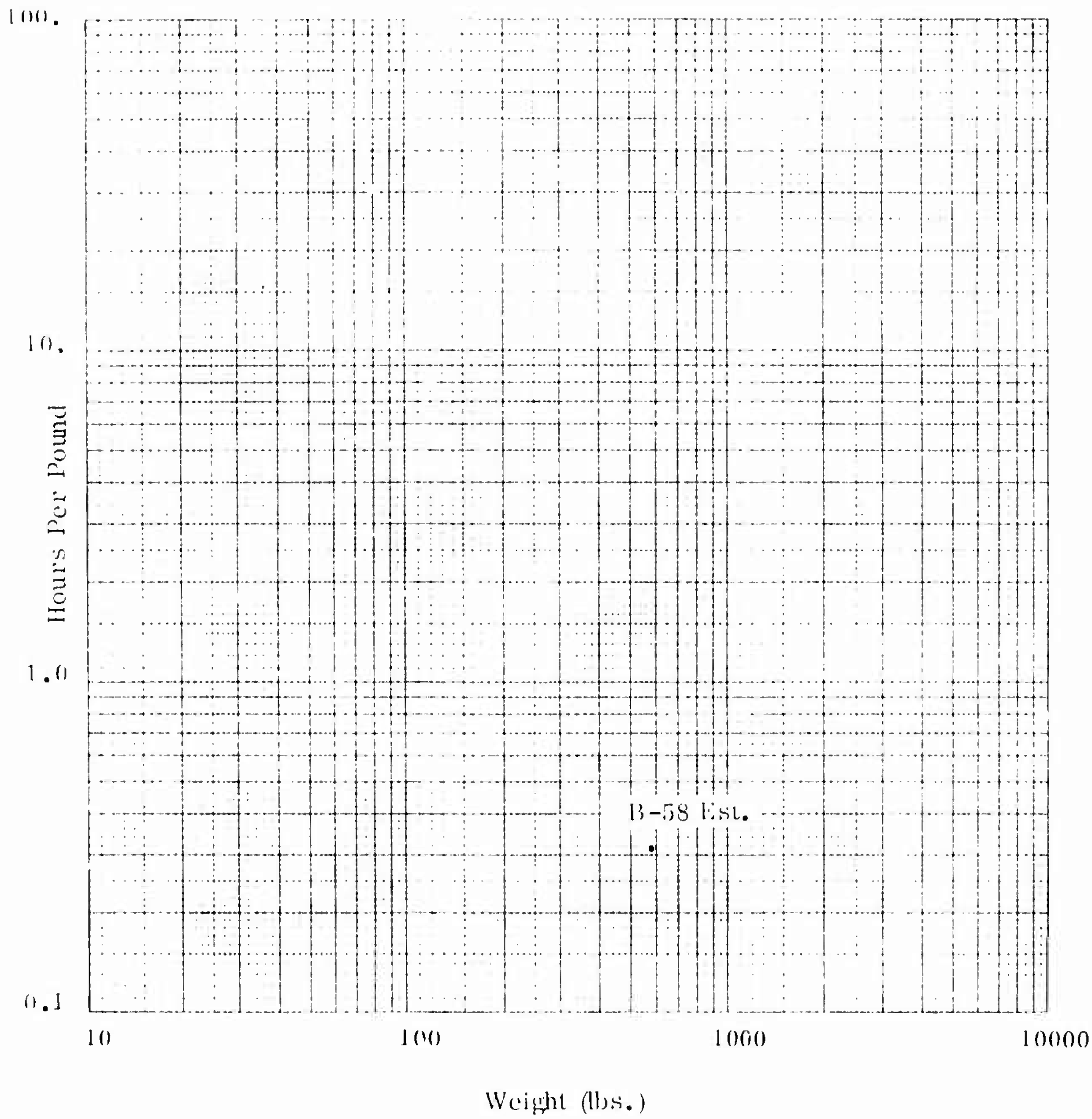

Figure F-94. Brakes Subassembly Hours Per Pound Against Weight.

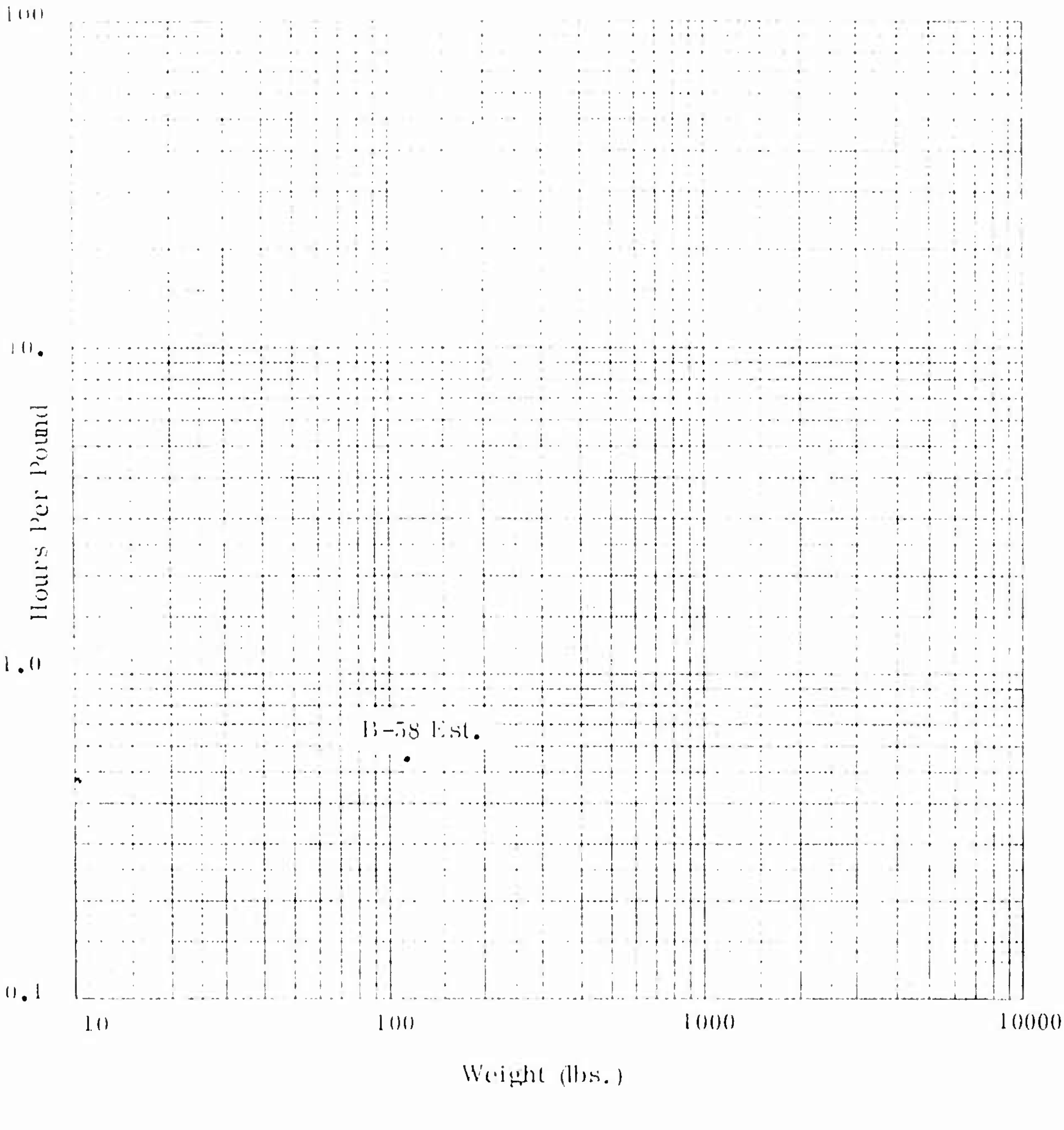

Figure F-95. Brake Controls Subassembly Hours Per Pound Against Weight.

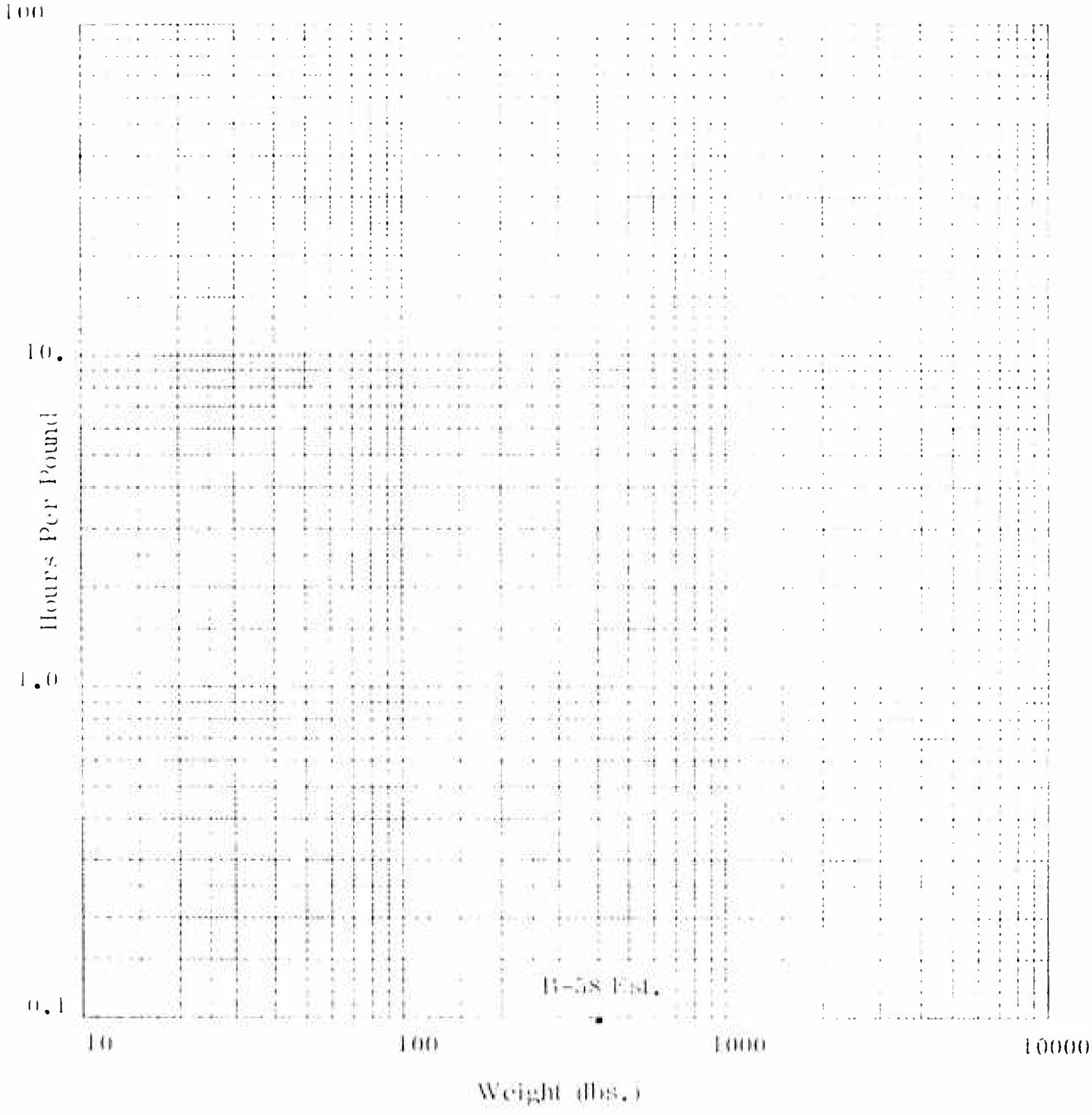

Figure F-96. Wheels Subassembly Hours Per Pound Against Weight.

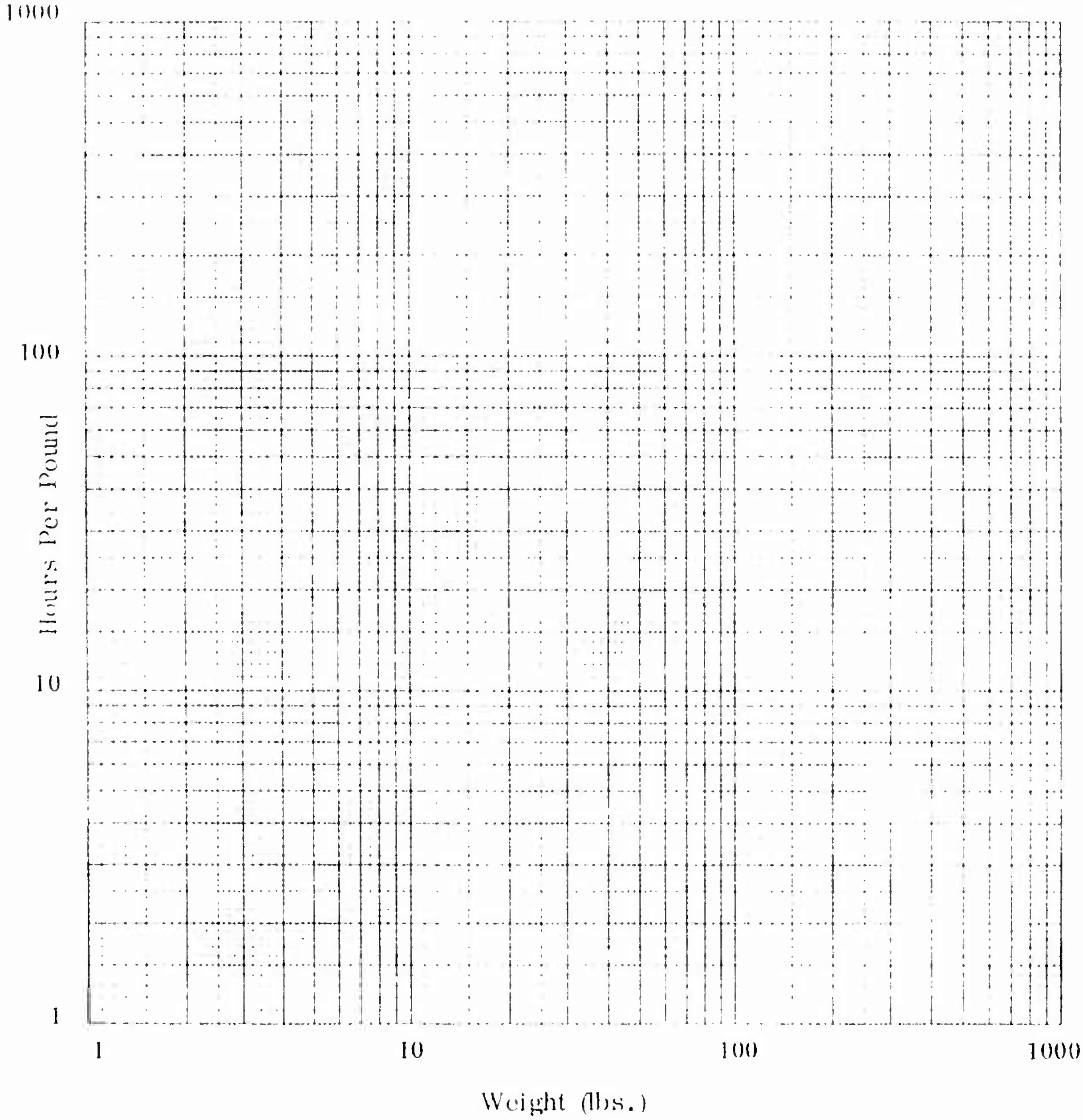

Figure F-97. Tires Subassembly Hours Per Pound Against Weight.

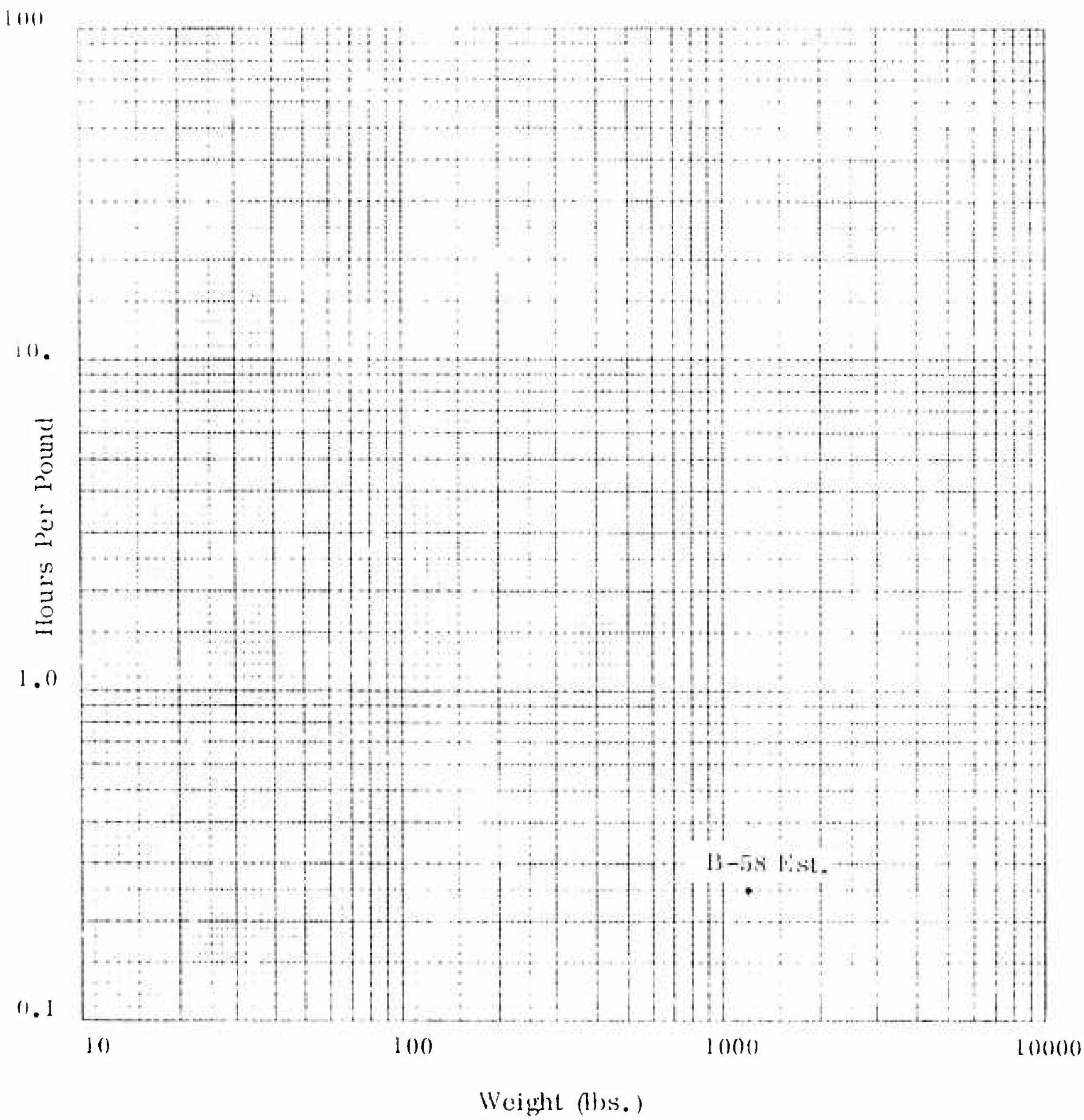

Figure F-98. Oleos Subassembly Hours
Per Pound Against Weight.

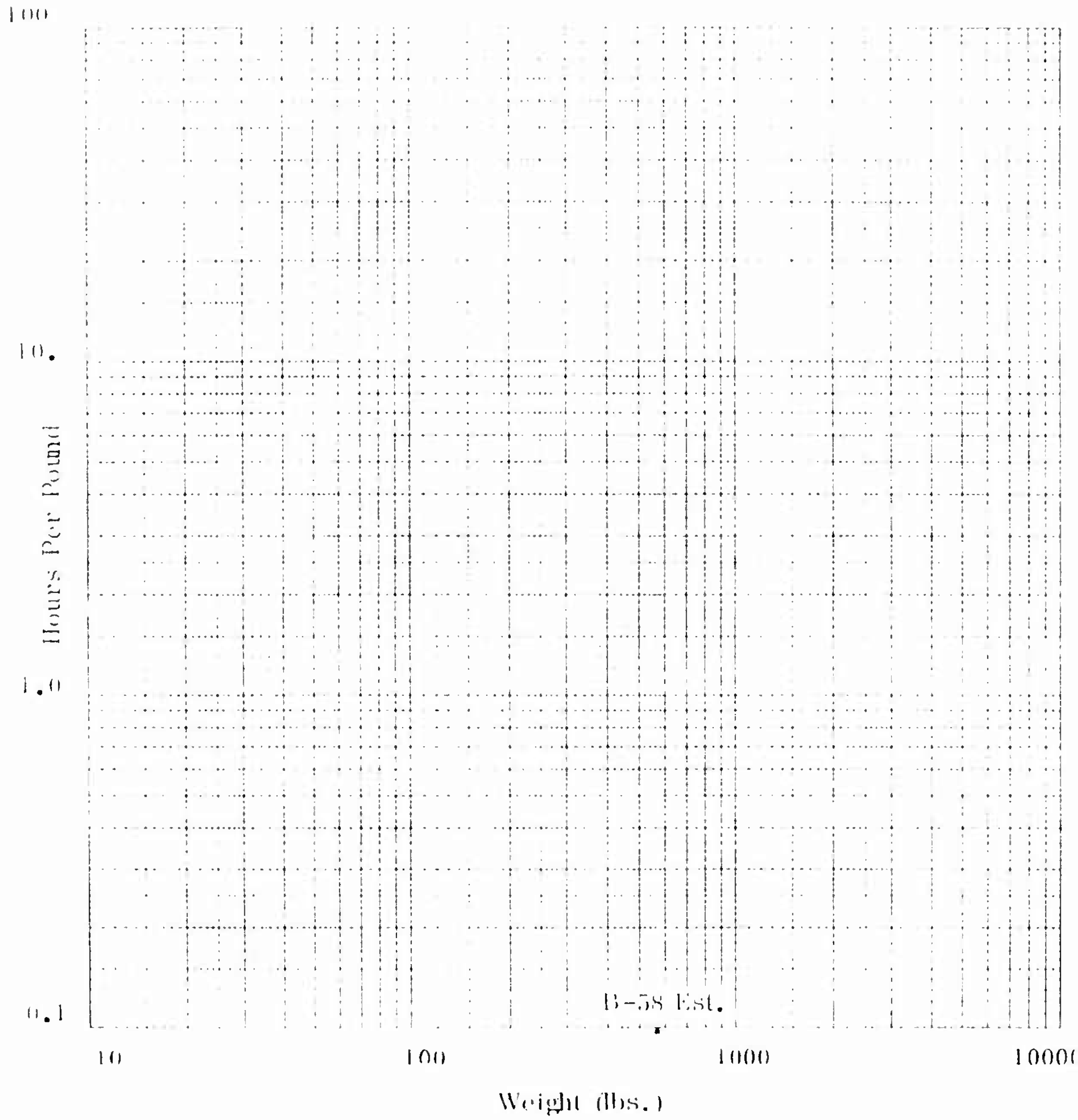

Figure F-99. Axles, Trunnion & Fittings Subassembly Hours Per Pound Against Weight.

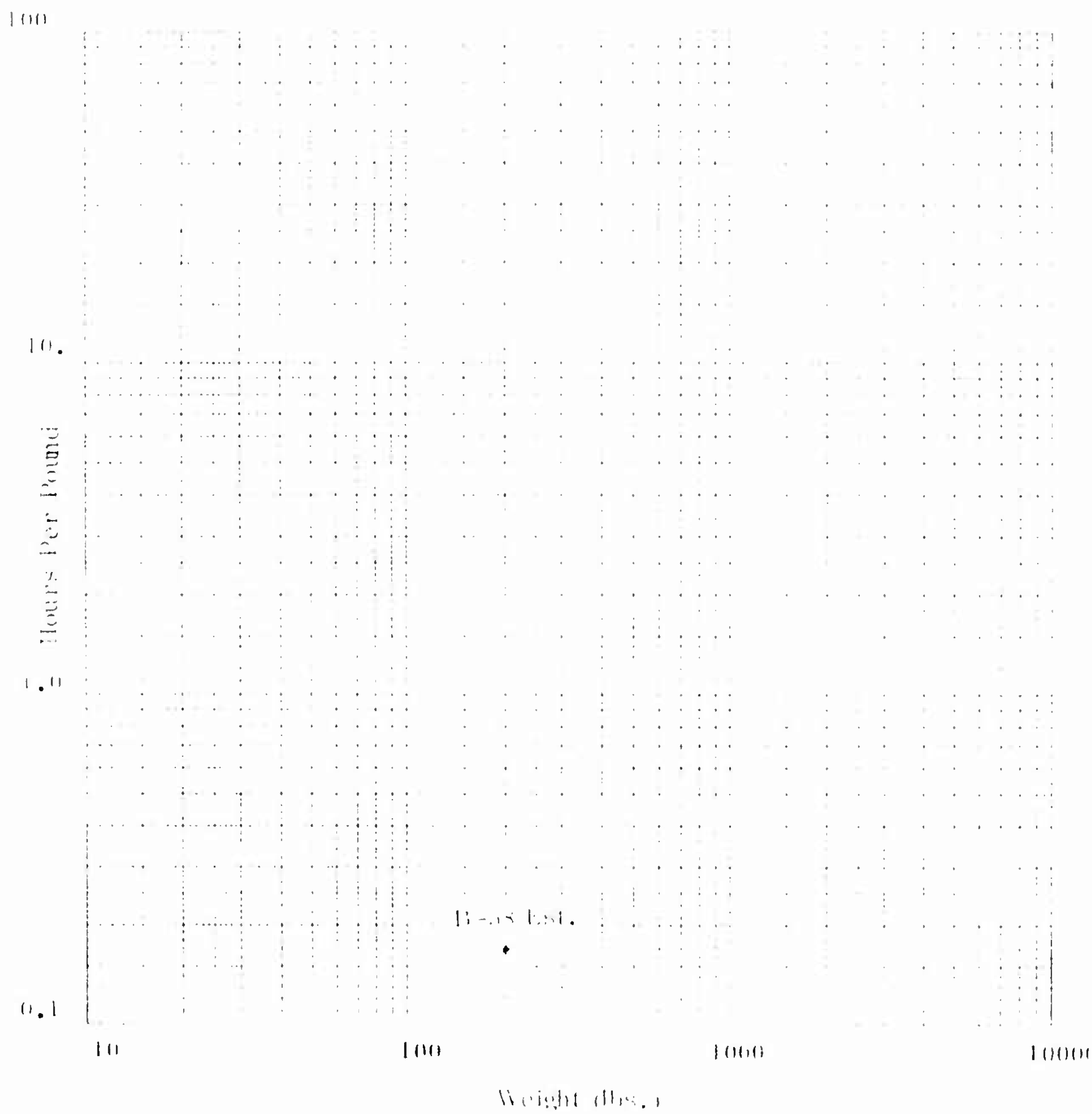

Figure I - 100. Drag Braces Subassembly Hours Per Pound Against Weight.

APPENDIX G

TYPES OF MATERIAL AND CONSTRUCTION TECHNIQUES

This appendix provides back-up data for the detail fabrication and subassembly complexity factors used for primary structure estimating, back-up data for the complexity factors used for secondary structure estimating, data for evaluating the effect of tolerance, and a table showing types of material and construction techniques.

COMPLEXITY FACTORS BACK-UP DATA FOR PRIMARY STRUCTURE

Back-up data for basic structure complexity factors, Tables 9, 10, 11, 12, 13 and 14 and Tables 16, 17, 18, 19, 20 and 21 are given in the series of Figures G-1 through G-16. These figures are oriented by structural element by construction type. They are the results of industrial engineering type analyses of variations in manufacturing operations attributable to different types of construction. Their development is further discussed in Volume 1. Both fabrication and assembly operations are included.

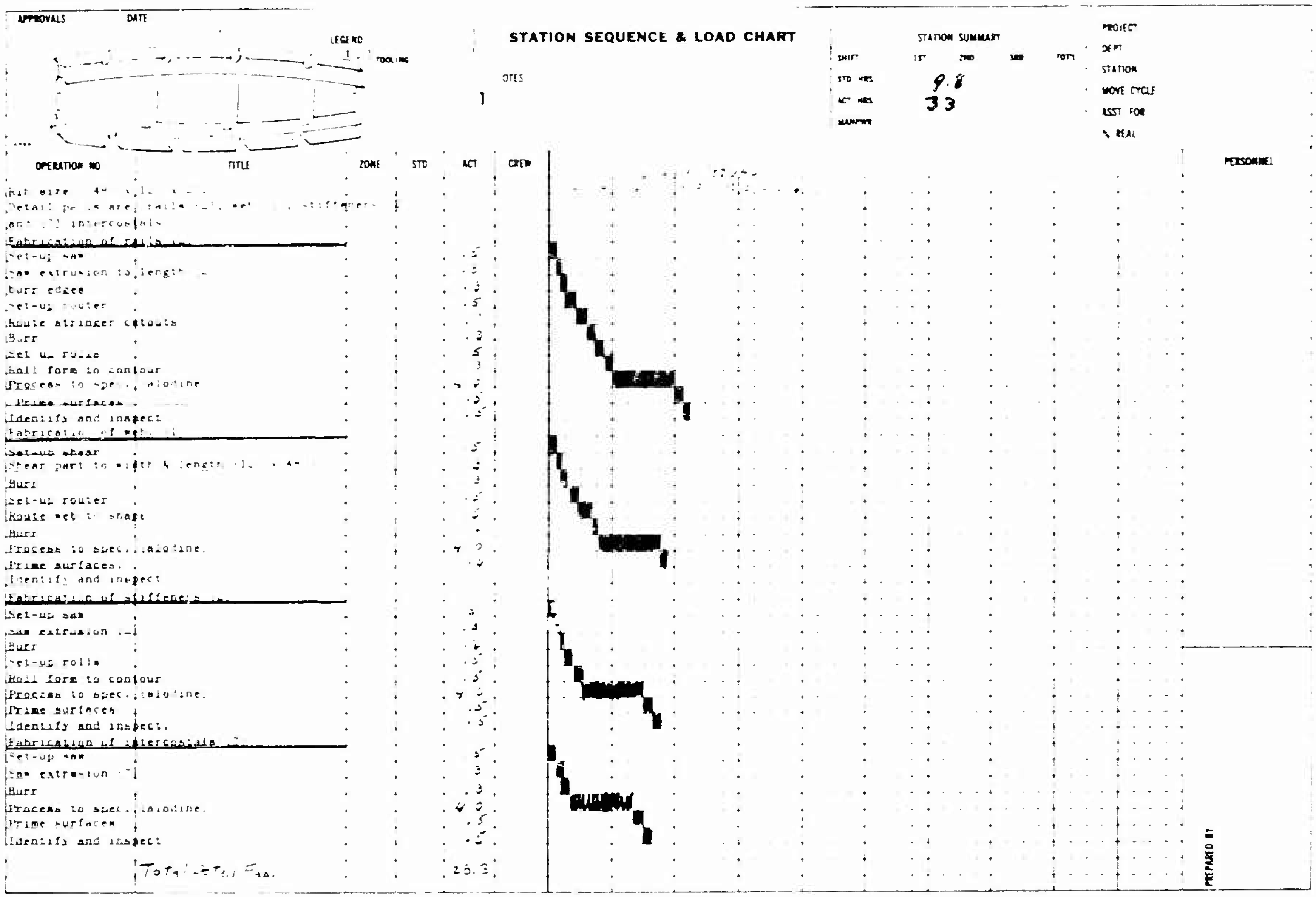

Figure G-1. Built-Up Web Stiffener Rib Analysis.

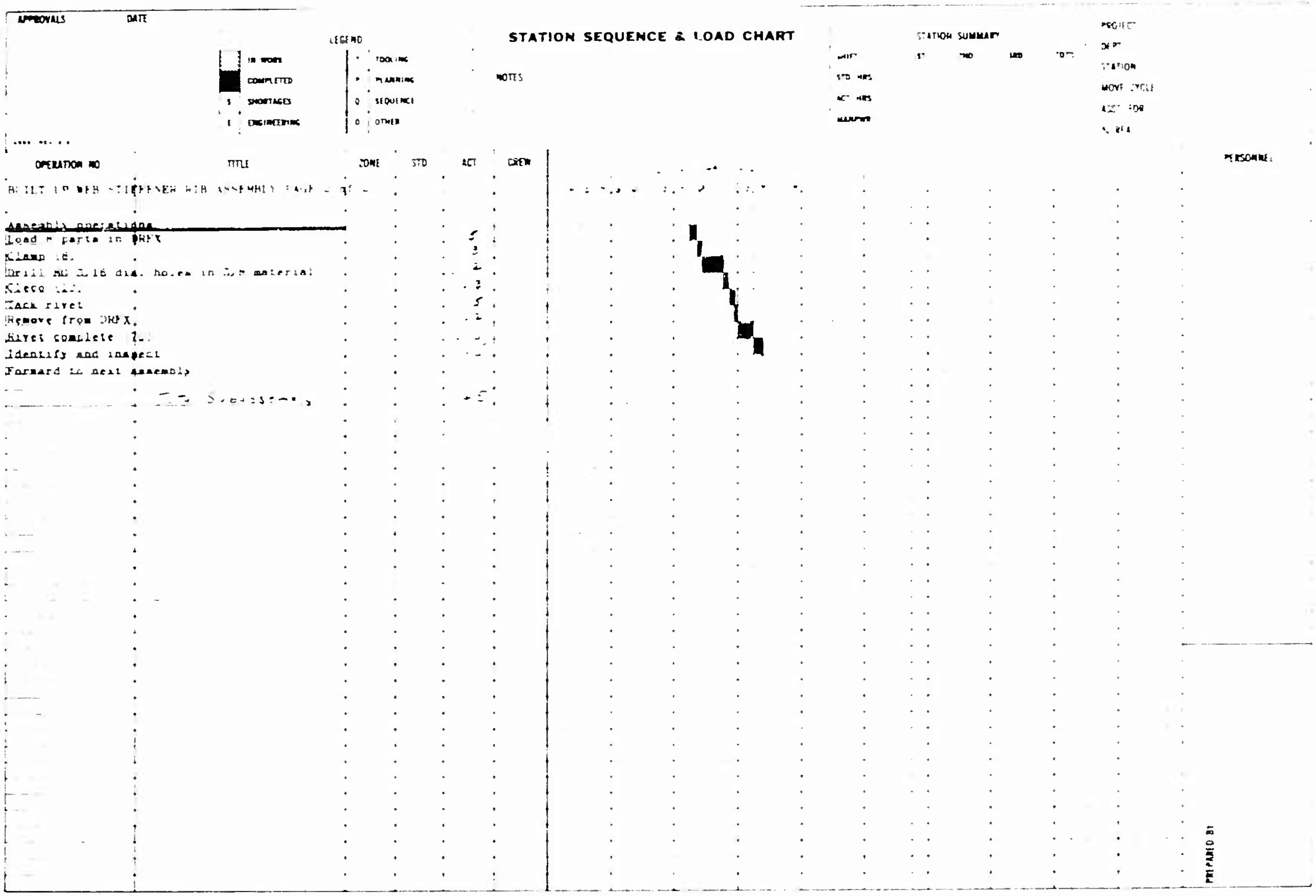

Figure G-1. Built-Up Web Stiffener Rib Analysis (Continued).

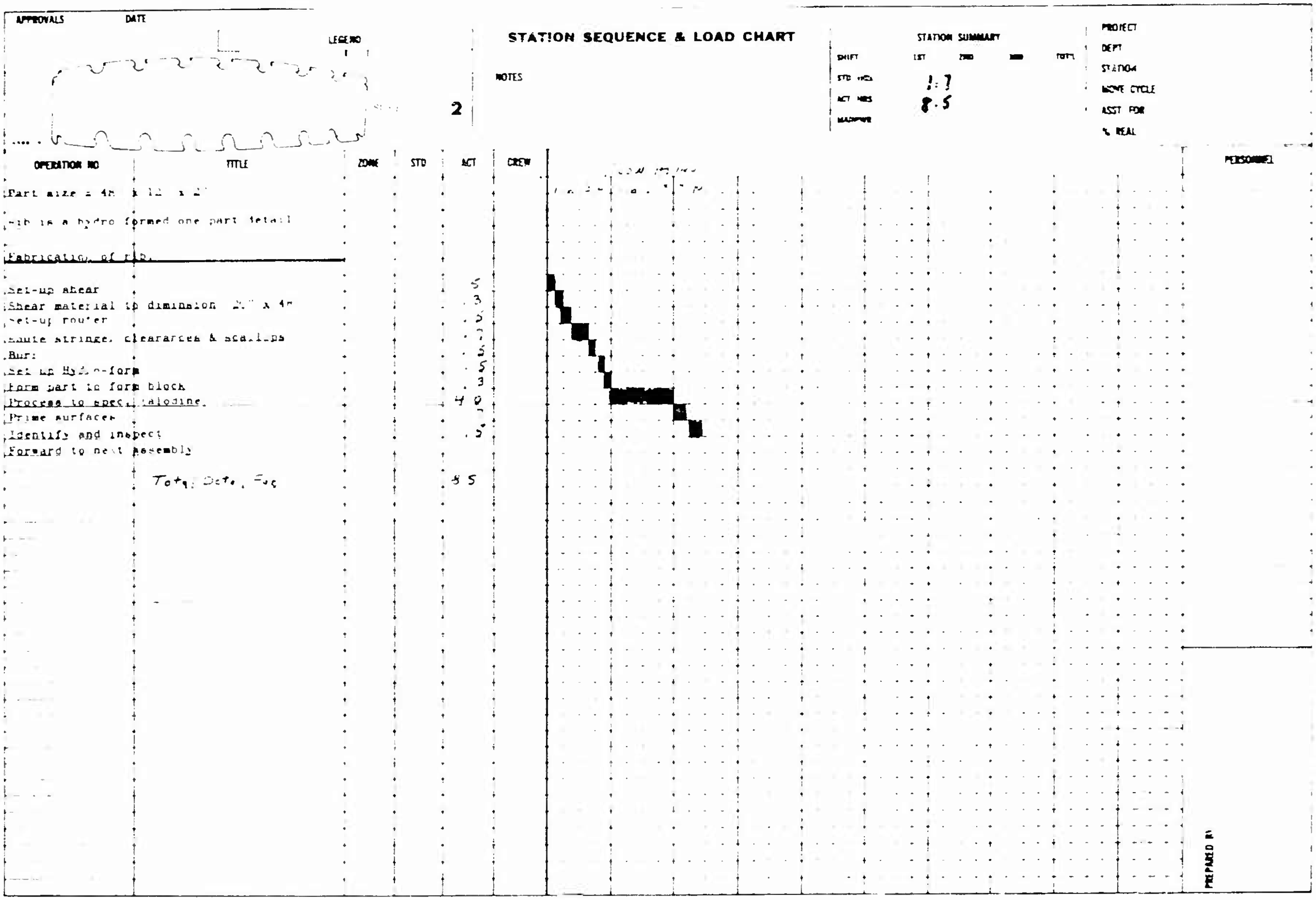

Figure G-2. Sheet Web Rib Analysis.

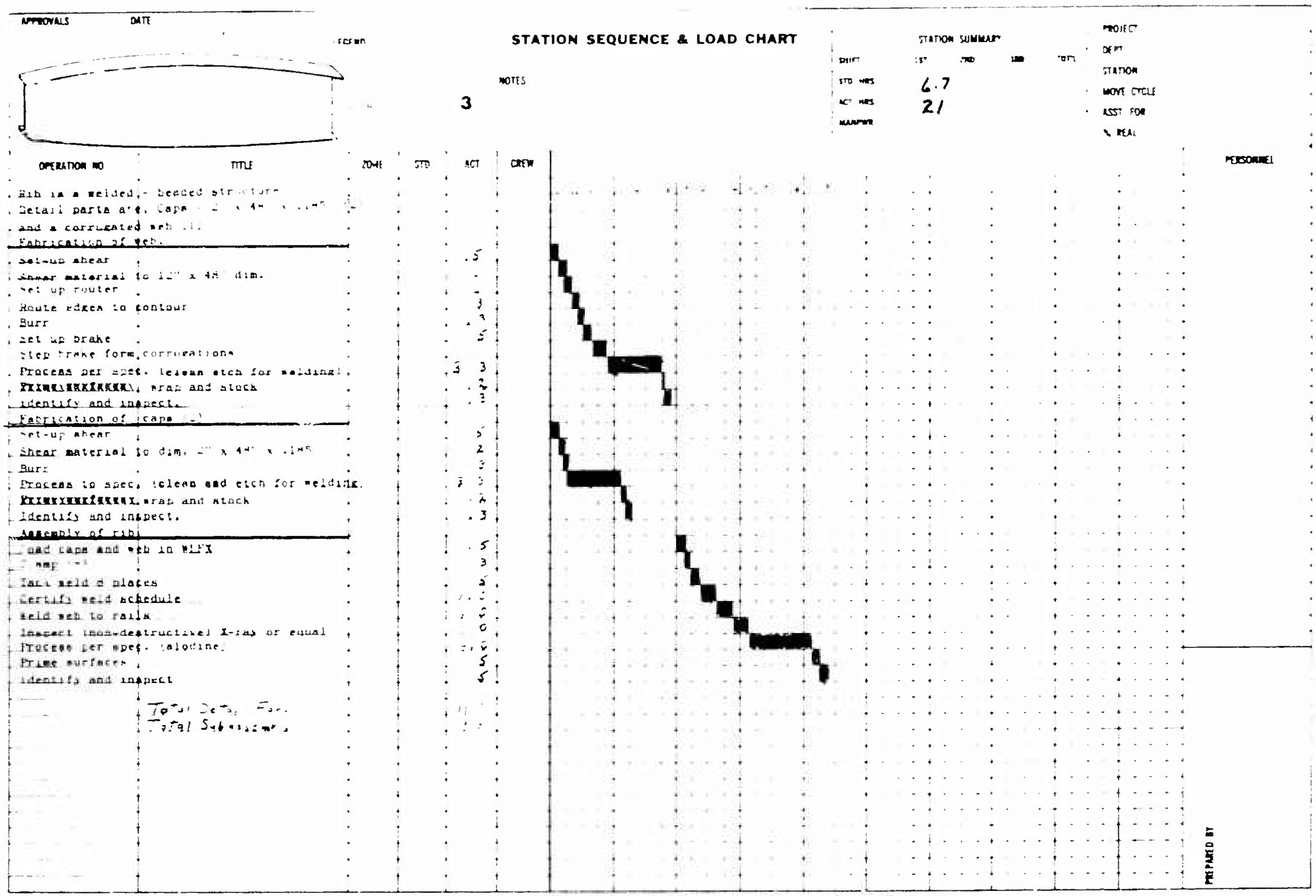

Figure G-3. Corrugated Web Rib Analysis.

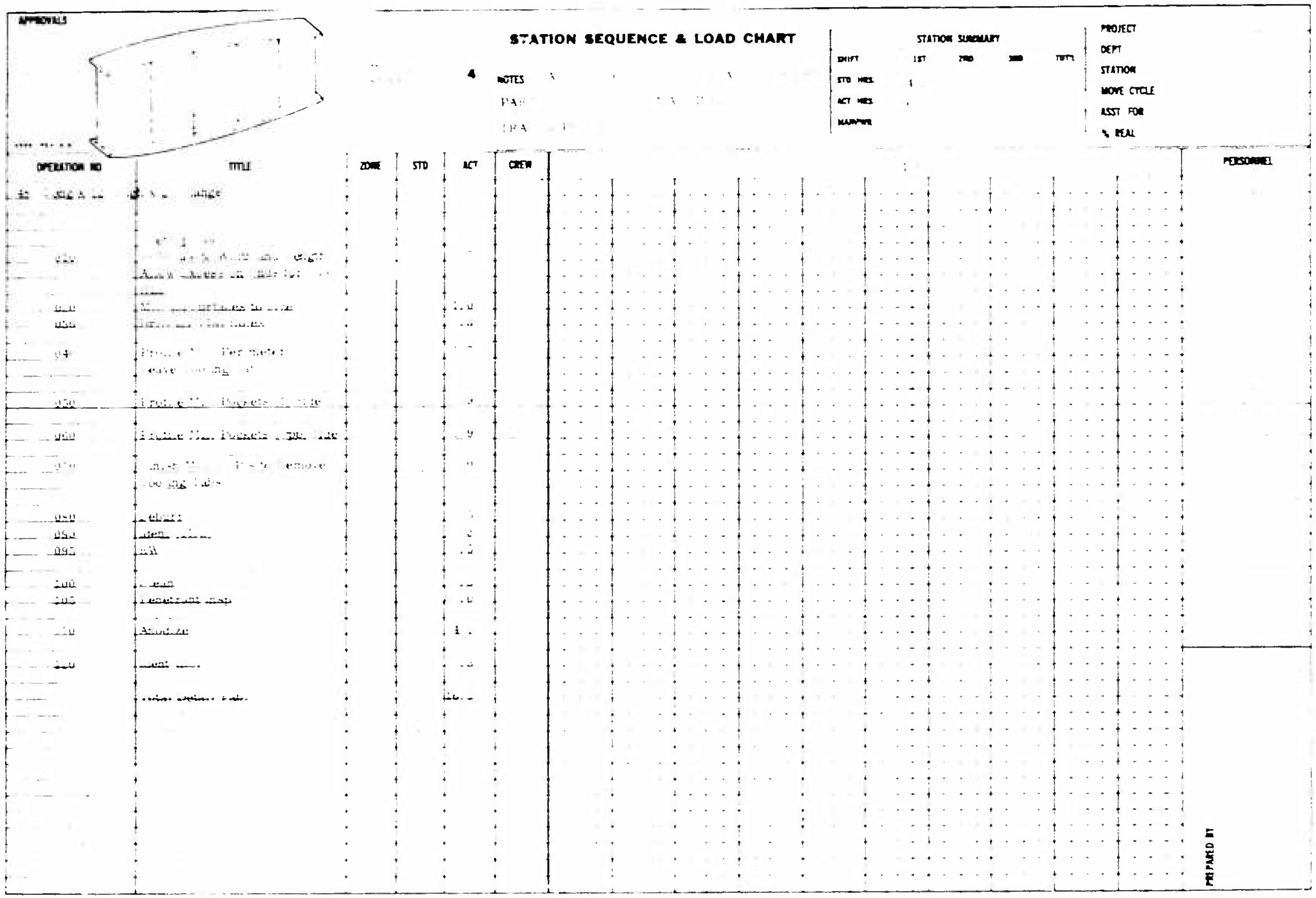

Figure G-4. Integral Web Stiffener Rib Analysis.

APPROVALS DATE

STATION SEQUENCE & LOAD CHART

5

NOTES

SHIFT	1ST	2ND	3RD	TOTL
STD HRS				
ACT HRS				
MANPWR				

PROJECT
DEPT
STATION
MOVE CYCLE
ASST FOR
% REAL

OPERATION NO	TITLE	ZONE	STD	ACT	CREW
[illegible]	[illegible]			[illegible]	
[illegible]	Penetrant insp			[illegible]	
[illegible]	Anodize			4.0	
[illegible]	[illegible]			[illegible]	
	[illegible]			[illegible]	

PERSONNEL

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Figure G-5. Integral Truss Rib Analysis.

APPROVALS DATE

LEGEND

6

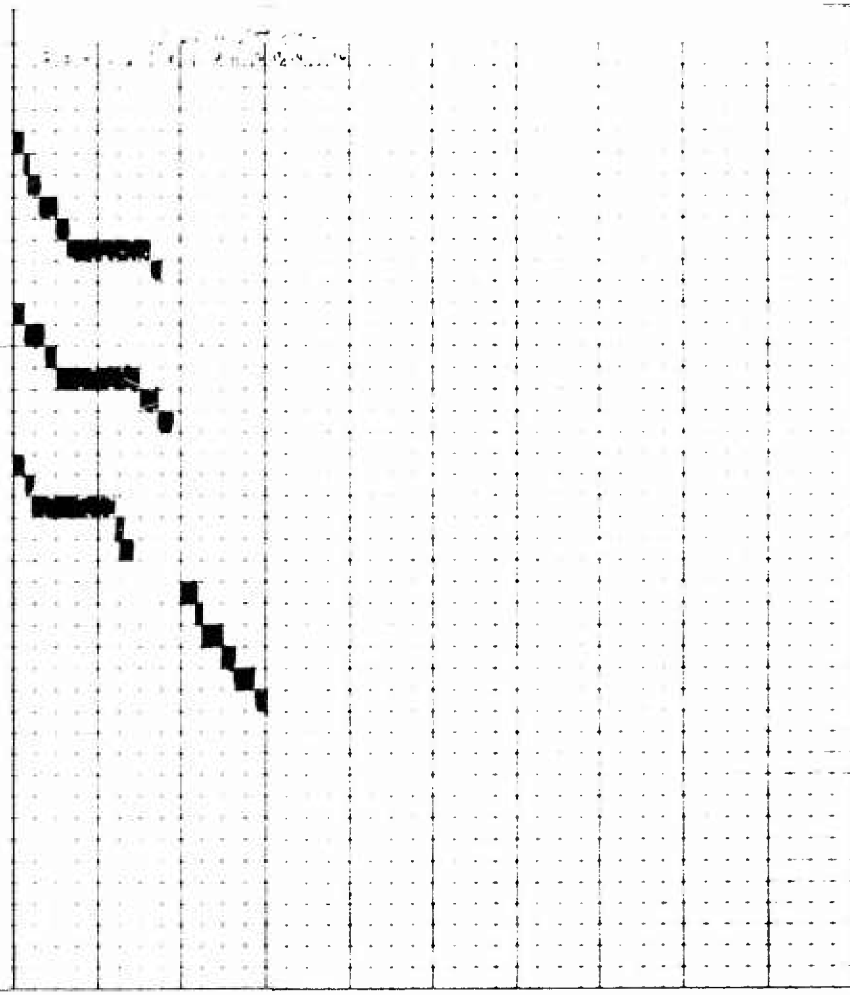
STATION SEQUENCE & LOAD CHART

NOTES

STATION SUMMARY	1ST	2ND	3RD	TOTAL
SHIFT				
STD HRS	7.2			
ACT HRS	23.5			
MANPWR				

PROJECT
DEPT
STATION
MOVE CYCLE
ASST FOR
% REAL

OPERATION NO / TITLE	ZONE	STD	ACT	CREW
Rib is a riveted truss assembly				
Detail parts are cap rails and extruded				
truss members lips				
Cap rail fabrication				
Set-up Shear			.5	
Shear material to dim. 2 x 48 x .125			.3	
Set-up router			.5	
Route scallops			.7	
Burr			.5	
Process per spec. (alodine)			4.0	
Identify and inspect.			.5	
Truss members				
Set-up saw.			.5	
Saw extrusion to length			.0	
Burr			.5	
Process to spec. (alodine)			4.0	
Prime surfaces			.7	
Identify and inspect.			.5	
Clip fabrication				
Set-up shear			.5	
Shear material to size 2" x 2" x .125"			3	
Process to spec. (alodine.			4.0	
Prime surfaces			.2	
Identify and inspect.			.3	
Assembly of rib				
Load rails, clips and truss members in ASFX.			.7	
Clamp			.3	
Drill 64 3/16 holes in .125 material			.0	
Cleco			.5	
Rivet 64 3/16 rivets			1.0	
Inspect			.5	
Forward to next assembly				
Total Detail Fab			35	
Total Subassembly			4.0	



PERSONNEL

PREPARED BY

Figure G-6. Built-Up Truss Rib Analysis.

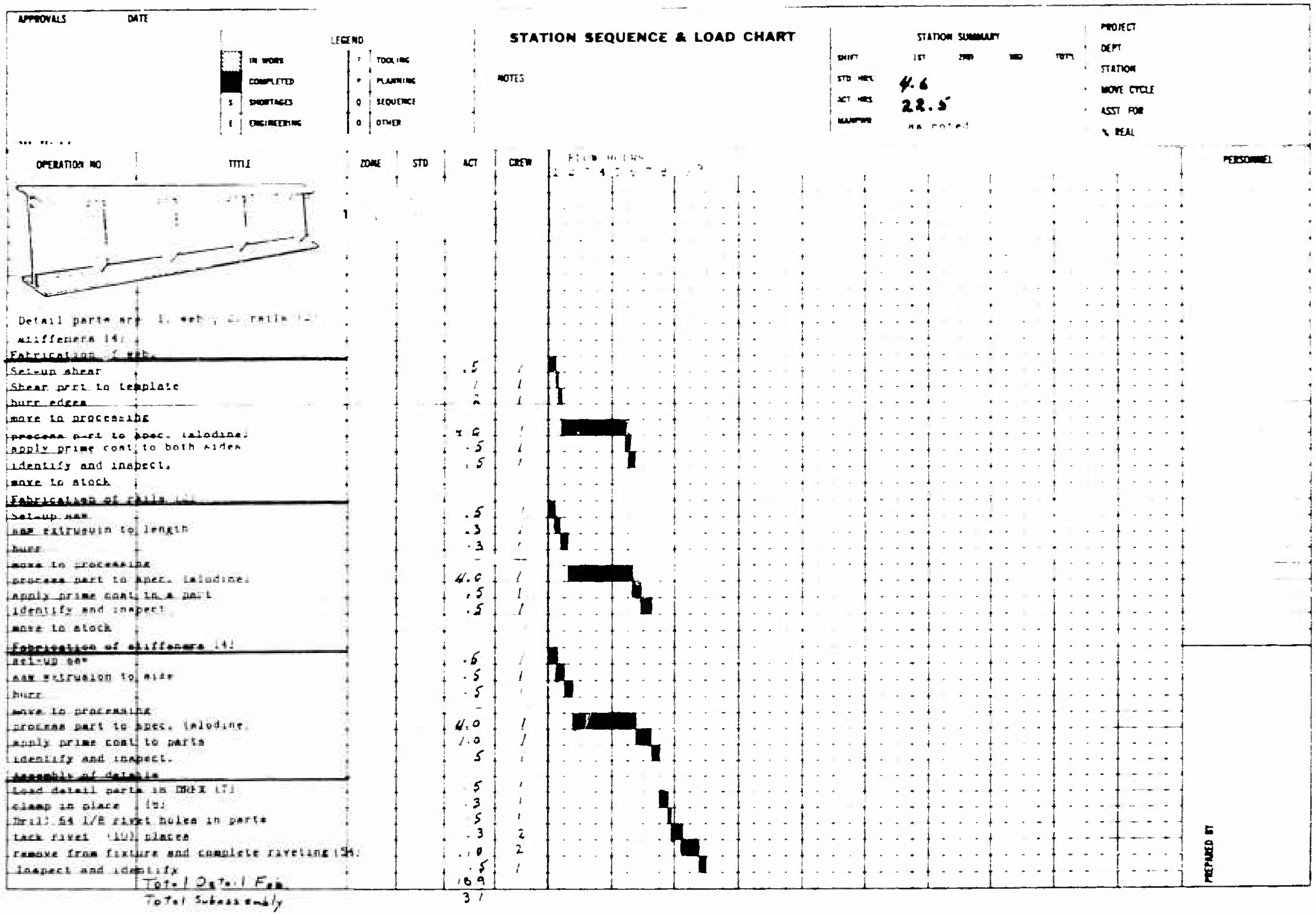


Figure G-7. Built-Up Web Stiffener Rib Analysis.

APPROVALS	DATE

LEGEND

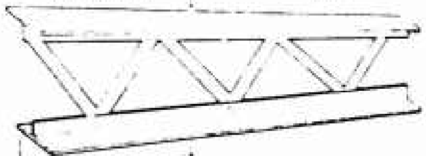
(blank)	IN WORK	T	TOOLING
(solid)	COMPLETED	P	PLANNING
S	SHORTAGES	Q	SEQUENCE
E	ENGINEERING	O	OTHER

STATION SEQUENCE & LOAD CHART

NOTES

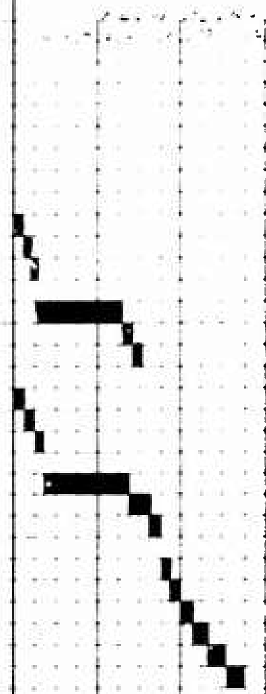
STATION SUMMARY	1ST	2ND	3RD	TOT'L
SHIFT				
STD HRS	5.1			
ACT HRS	16.8			
MANPWR				

PROJECT
DEPT
STATION
MOVE CYCLE
ASST FOR
% REAL



2

OPERATION NO	TITLE	ZONE	STD	ACT	CREW
	Detail parts are: rails (2), stiffeners				
	Fabrication of rails				
	set-up a saw			.5	
	saw extrusion to length (2)			.3	1
	burr edges			.3	1
	move to processing			—	
	process parts to spec. (alodine)			4.0	1
	prime parts			.5	1
	identify and inspect			.5	1
	Fabrication of stiffeners (6)				
	set-up saw			.5	1
	saw extrusion to length			.5	1
	burr edges			.5	1
	move to processing			—	
	process parts to spec. (alodine)			4.0	1
	prime parts			1.0	1
	identify and inspect.			.5	1
	Assembly of detail parts				
	load (8) parts in DHFX			.5	1
	Clamp (8) places			.5	1
	Drill 27 3/16 holes in parts 1/4" thick			.7	1
	tack rivet (7) places			.5	2
	remove from fixture and complete riveting			1.0	2
	Identify and inspect.			.5	1
	Move to next assembly				
	Total Detail Fab			13.1	
	Total Subassembly			3.7	

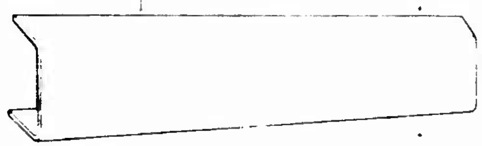


PERSONNEL

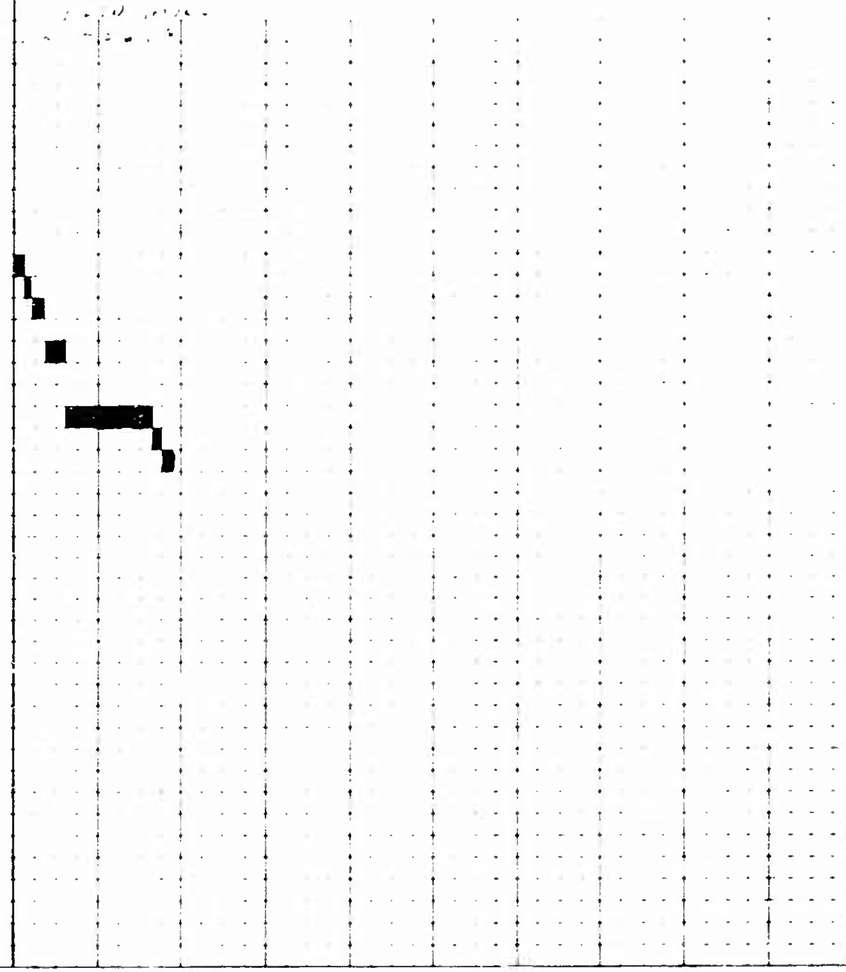
PREPARED BY

Figure G-8 Built-Up Truss Rib Analysis.

APPROVALS	DATE	LEGEND		STATION SEQUENCE & LOAD CHART	STATION SUMMARY					
		IN WORK	T TOOLING	NOTES		1ST	2ND	3RD	TOTL	PROJECT
		COMPLETED	P PLANNING		SHIFT					DEPT
		S SHORTAGES	Q SEQUENCE		STD HRS	1.8				STATION
		E ENGINEERING	O OTHER		ACT HRS	7.5				MOVE CYCLE
					MANPWR					ASST JR
										% REAL



OPERATION NO	TITLE	ZONE	STD	ACT	CREW
	Detail part is brake formed sheet stock				
	Fabrication				
	set-up shear			.5	
	shear material to size .12x4in.			.3	
	move to brake				
	set up brake			.5	
	form part to template			.7	
	inspect			.5	
	move part to processing				
	process to spec. (alodine)			4.0	
	prime surfaces			.5	
	identify and inspect			.5	
	move part to next assembly				
	Total Detail Fab			7.5	



PERSONNEL

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Figure G-9. Sheet-Web Rib Analysis.

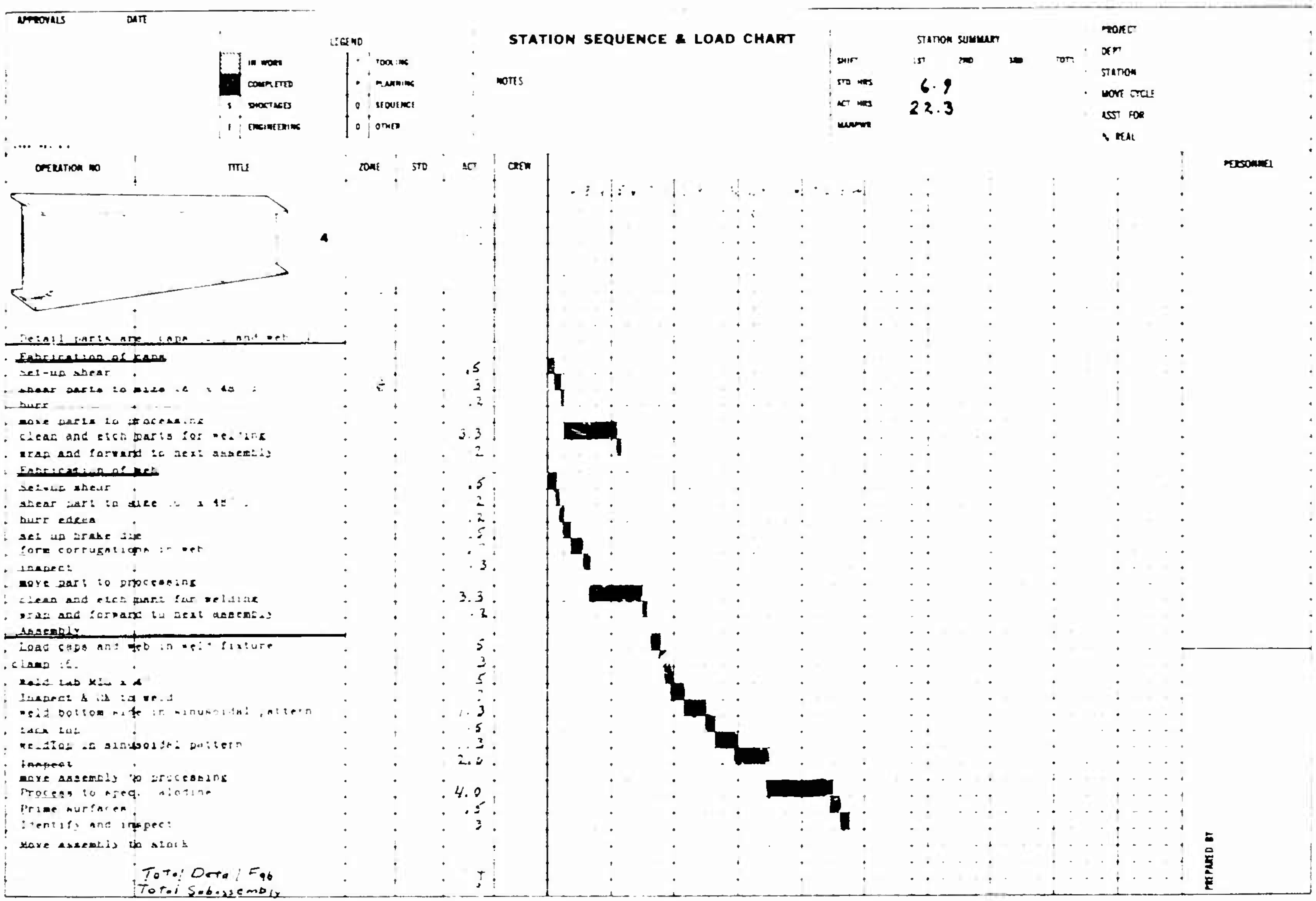


Figure G-10. Corrugated Web Rib Analysis.

APPROVALS DATE

LEGEND

	IN WORK	T	TOOLING
	COMPLETED	P	PLANNING
S	SHORTAGES	Q	SEQUENCE
E	ENGINEERING	O	OTHER

STATION SEQUENCE & LOAD CHART

NOTES

STATION SUMMARY

	1ST	2ND	3RD	TOT'L
SHIFT				
STD HRS				
ACT HRS				
MANPWR				

PROJECT
DEPT
STATION
MOVE CYCLE
ASST FOR
% REAL

OPERATION NO	TITLE	ZONE	STD	ACT	CREW
		5			
040					

PERSONNEL

PREPARED BY

Figure G-11. Integral Web Stiffener Rib Analysis.

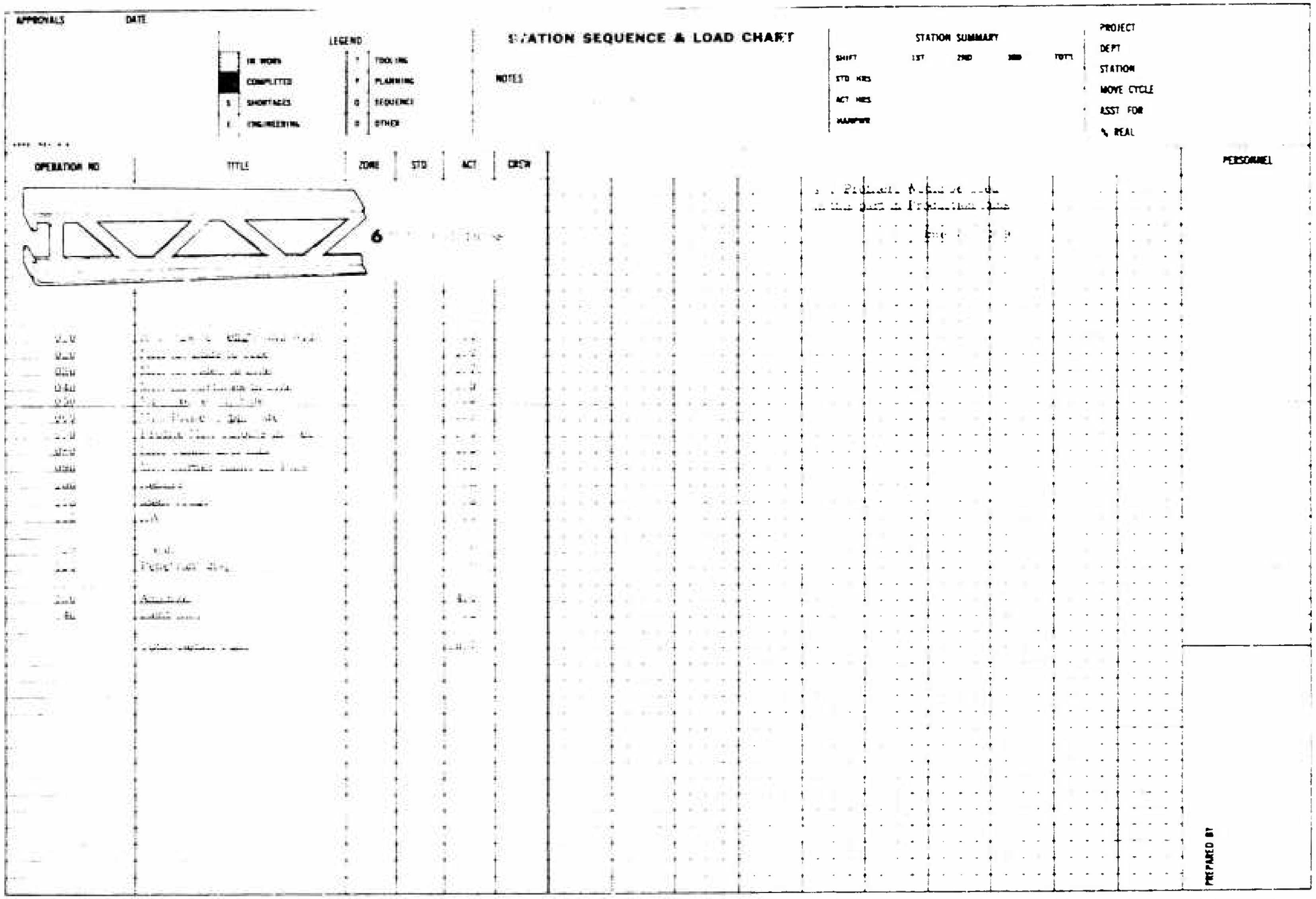


Figure G-12. Integral Truss Rib Analysis.

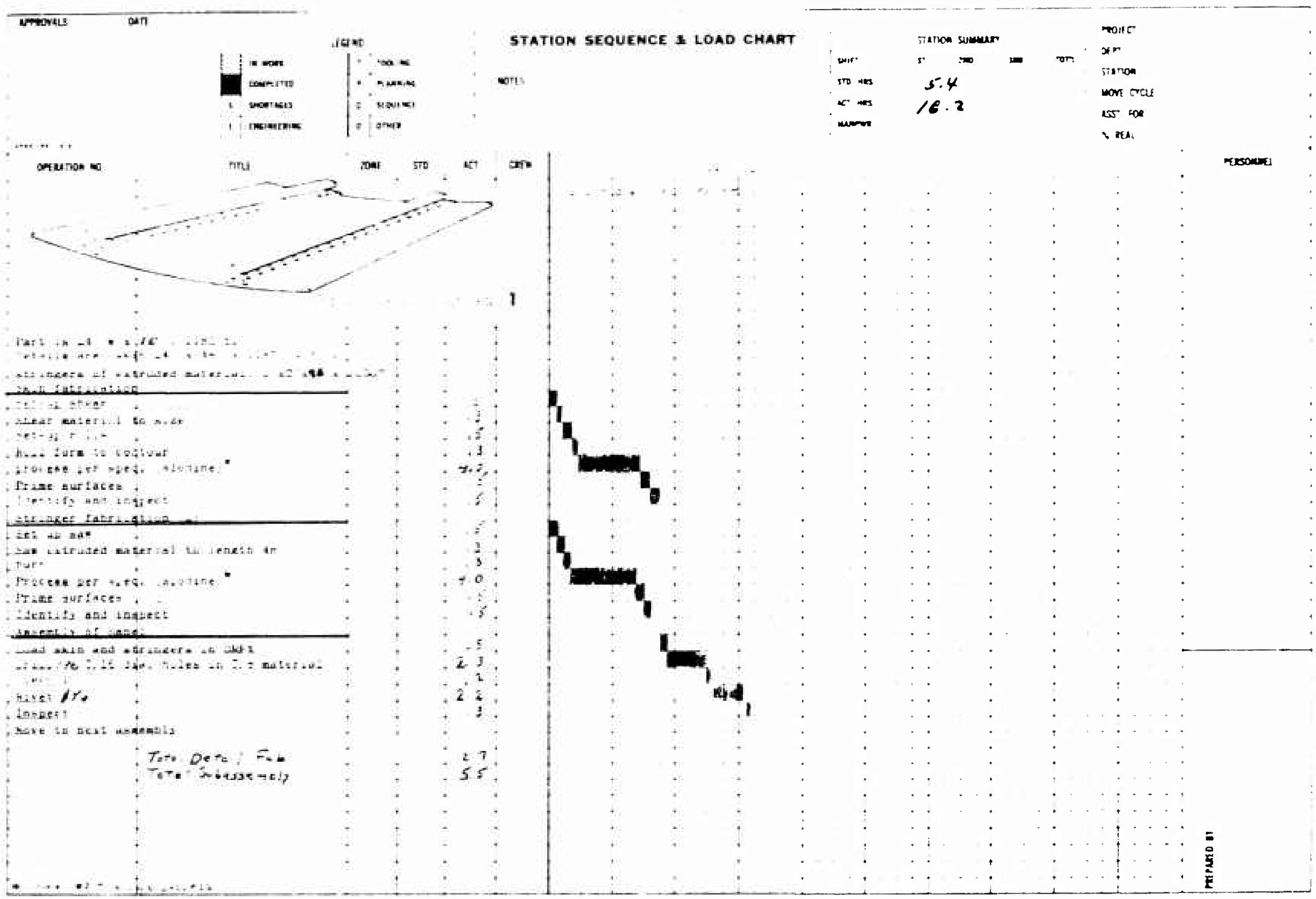


Figure G-13. Built-Up Skin-Stringer Rib Analysis.

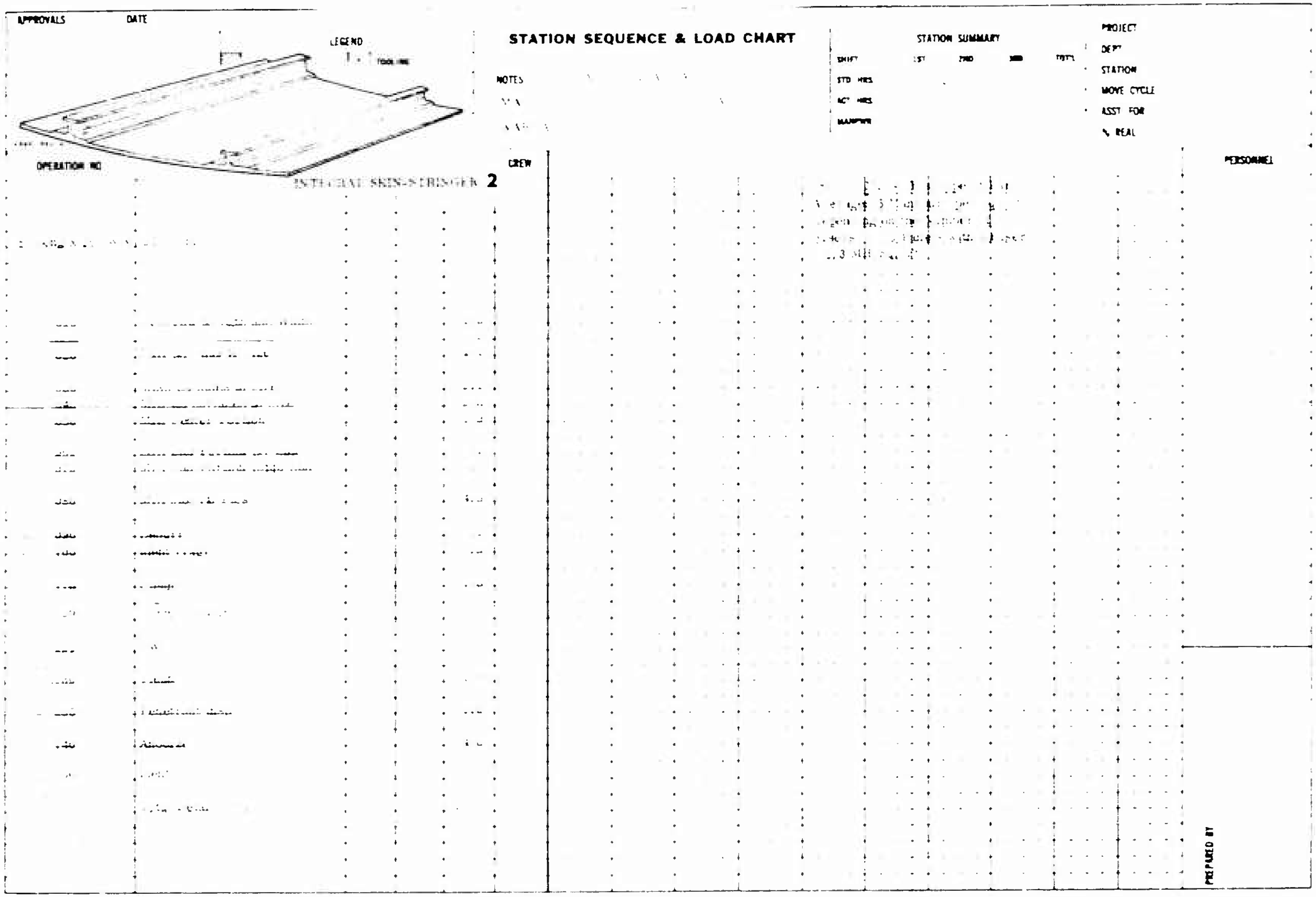


Figure G-14. Integral Skin-Stringer Rib Analysis.

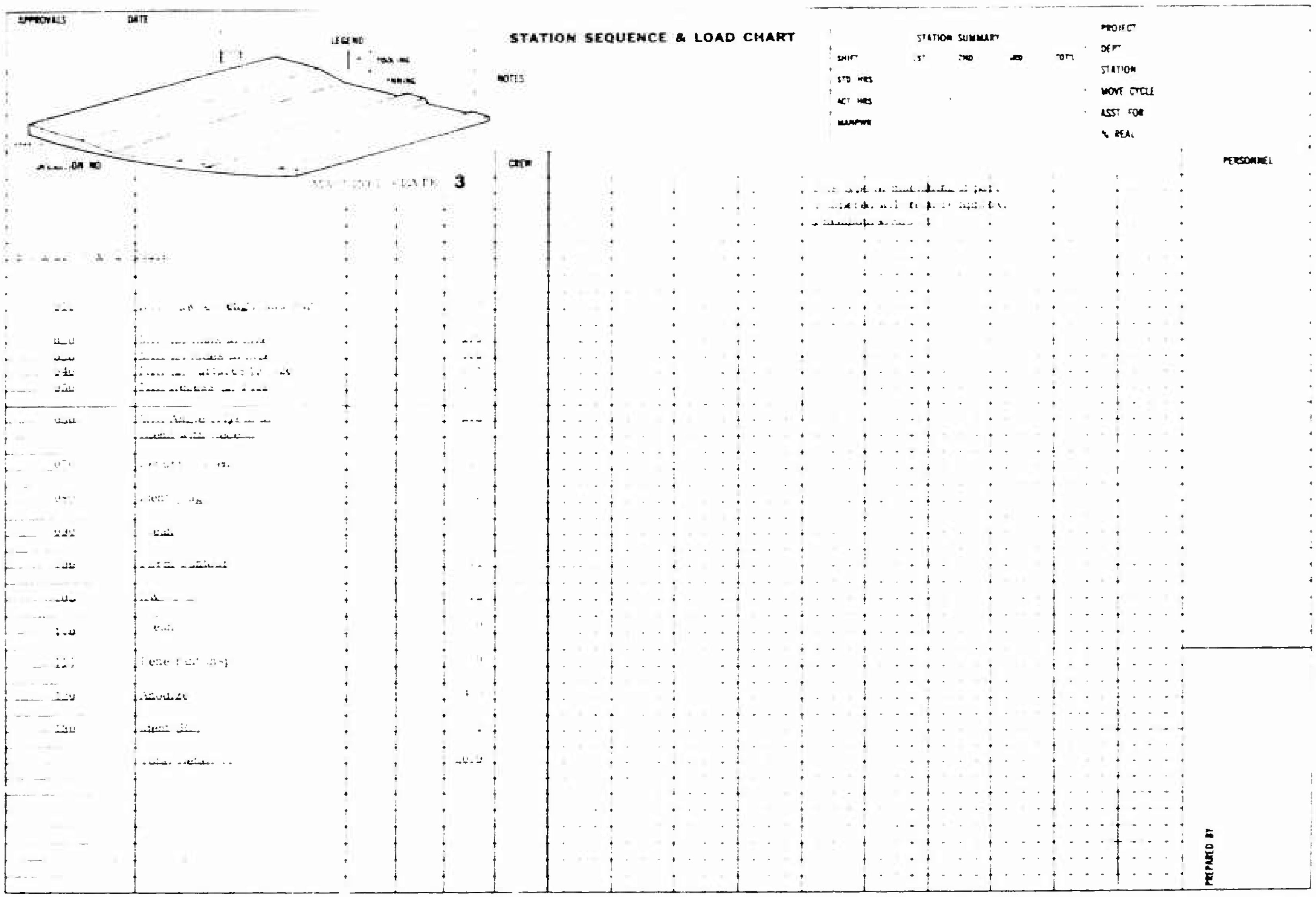


Figure G-15. Machined Plate Rib Analysis.

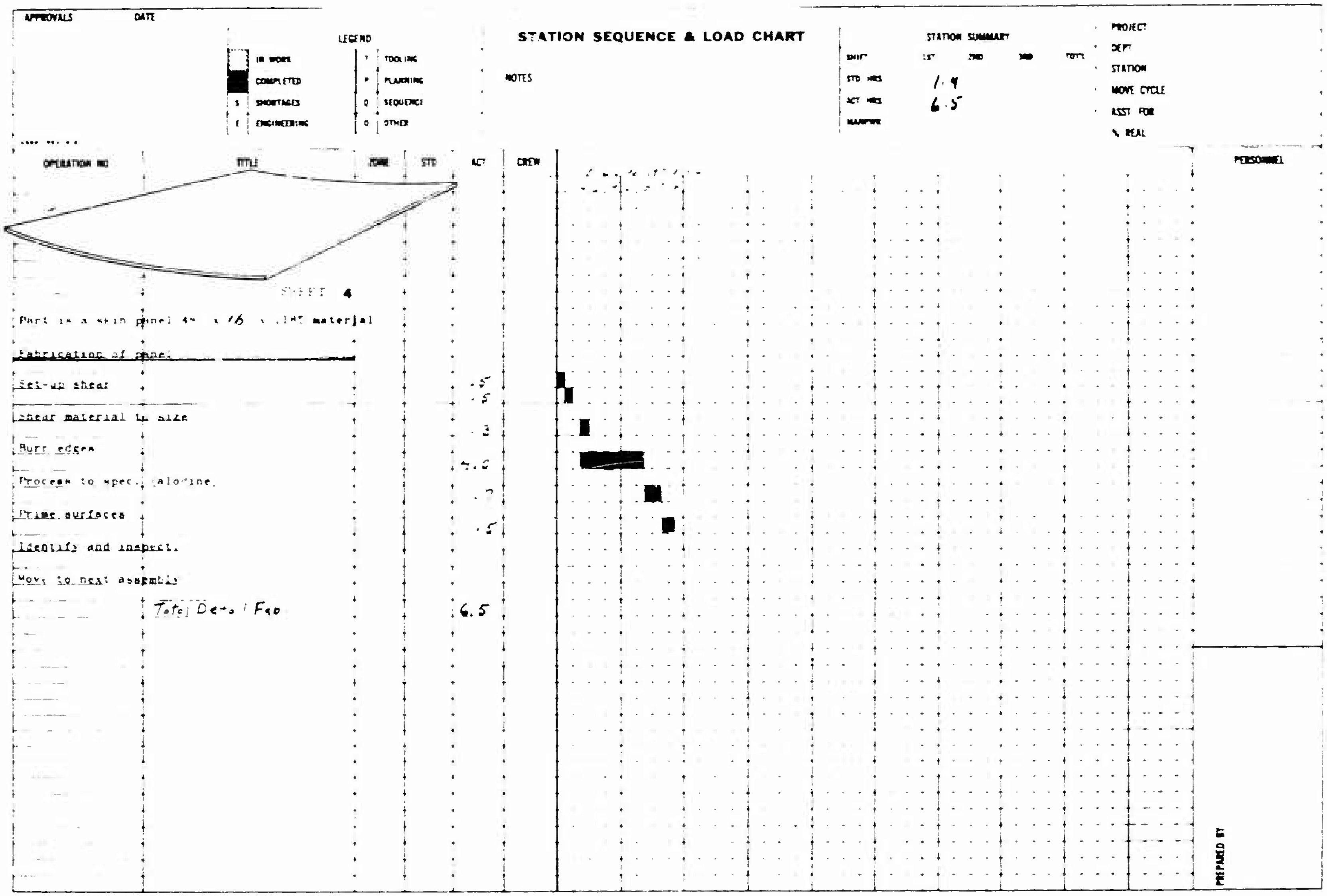


Figure G-16. Sheet Rib Analysis.

BACK-UP DATA FOR SECONDARY STRUCTURE

Back-up data for fabrication and subassembly manufacturing labor complexity factors for secondary structure, given in Tables 25 and 26, is given in Figures G-17 through G-36. The development of complexity factors for fuselage secondary structure components introduces additional variations: The notion of complexity with respect to these components is not clearly defined by differences in type of construction and type of material, and the previous industrial engineering type of analysis is only partially applicable. As a result, factors are determine primarily by analogy to available cost data.

The approach to analyzing these data to quantify complexity and determine the interrelationship to estimating coefficients is discussed in detail in Section 2.2.3 of the Technical Volume of this report.

The data in Figures G-17 through G-36 was obtained from Industrial Engineering studies. They consider learning effects by evaluating costs at the 1st unit and at the 100th unit and cost and weight effects of substituting materials in a given structural element. The data represents combined fabrication and assembly labor.

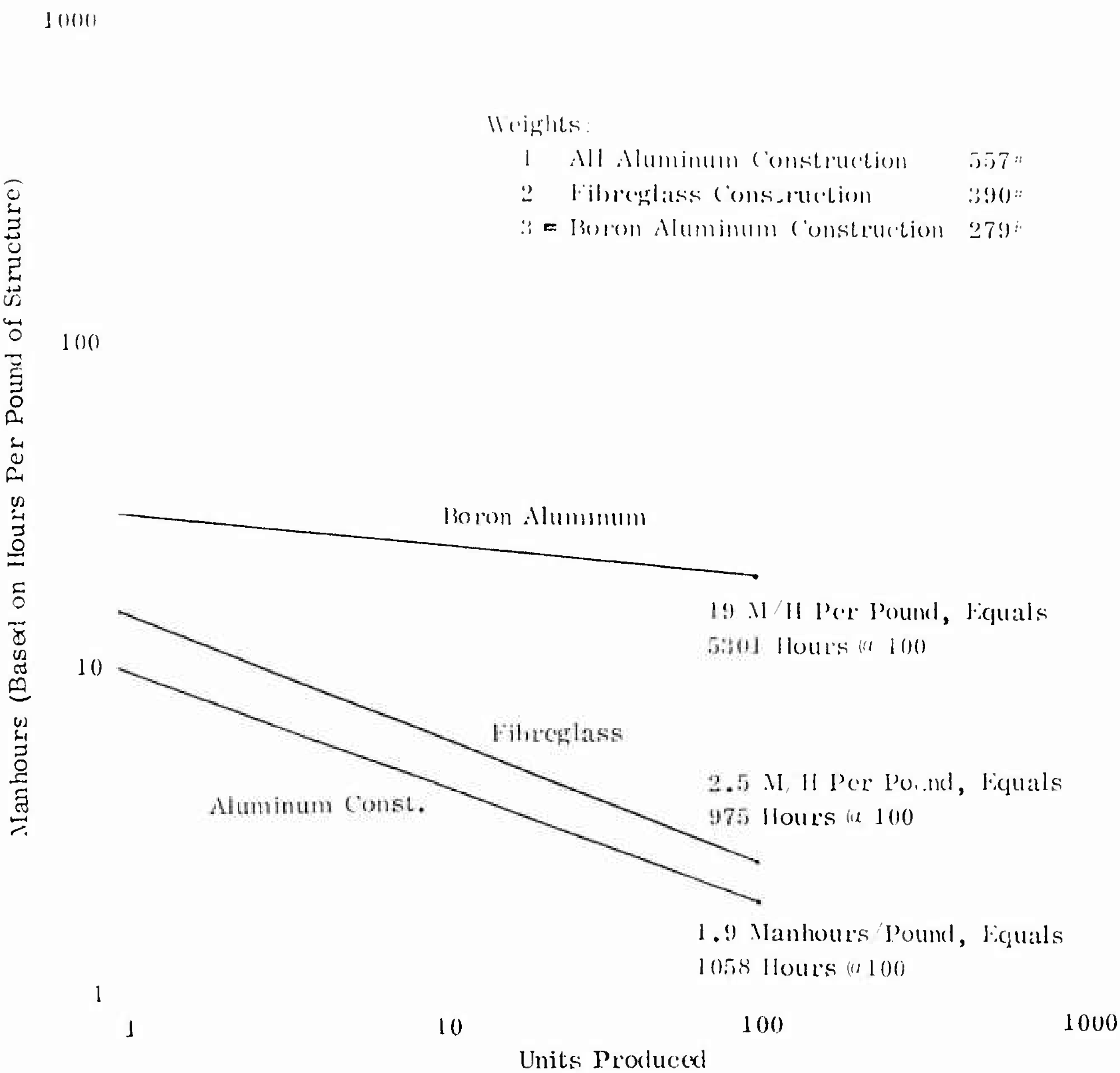
THE EFFECTS OF TOLERANCE

Figure G-37 gives an idea of the impact of tolerance on machining cost. These results are based on industrial engineering studies. They have not been directly applied to the complexity factors shown. In order to make such an application, it would first be necessary to normalize the existing data to a common tolerance figure: and such data was not collected as part of the study. The above information can be made use of for trade studies involving machined components where the degree of tolerance is known for a given historical data point involved and is specified for design alternatives.

The figure approximates a comparison of machining cost versus manufacturing tolerance for a given operation within the range of the full black line. As the tolerance is reduced for any given operation, the cost increases, assuming the extreme looseness that will satisfy functional and weight design requirements to be 100%, or in effect a reference of one.

TYPES OF MATERIAL AND CONSTRUCTION TECHNIQUES

The aerodynamic surfaces of the aircraft indicated have been analyzed to determine the types of construction and material represented thereby. This analysis shows the limited number of variations in structural concepts represented in actual experience and illustrates that cost data would be lacking for some concepts even if a complete cost data reconstruction was possible and affordable. This argument

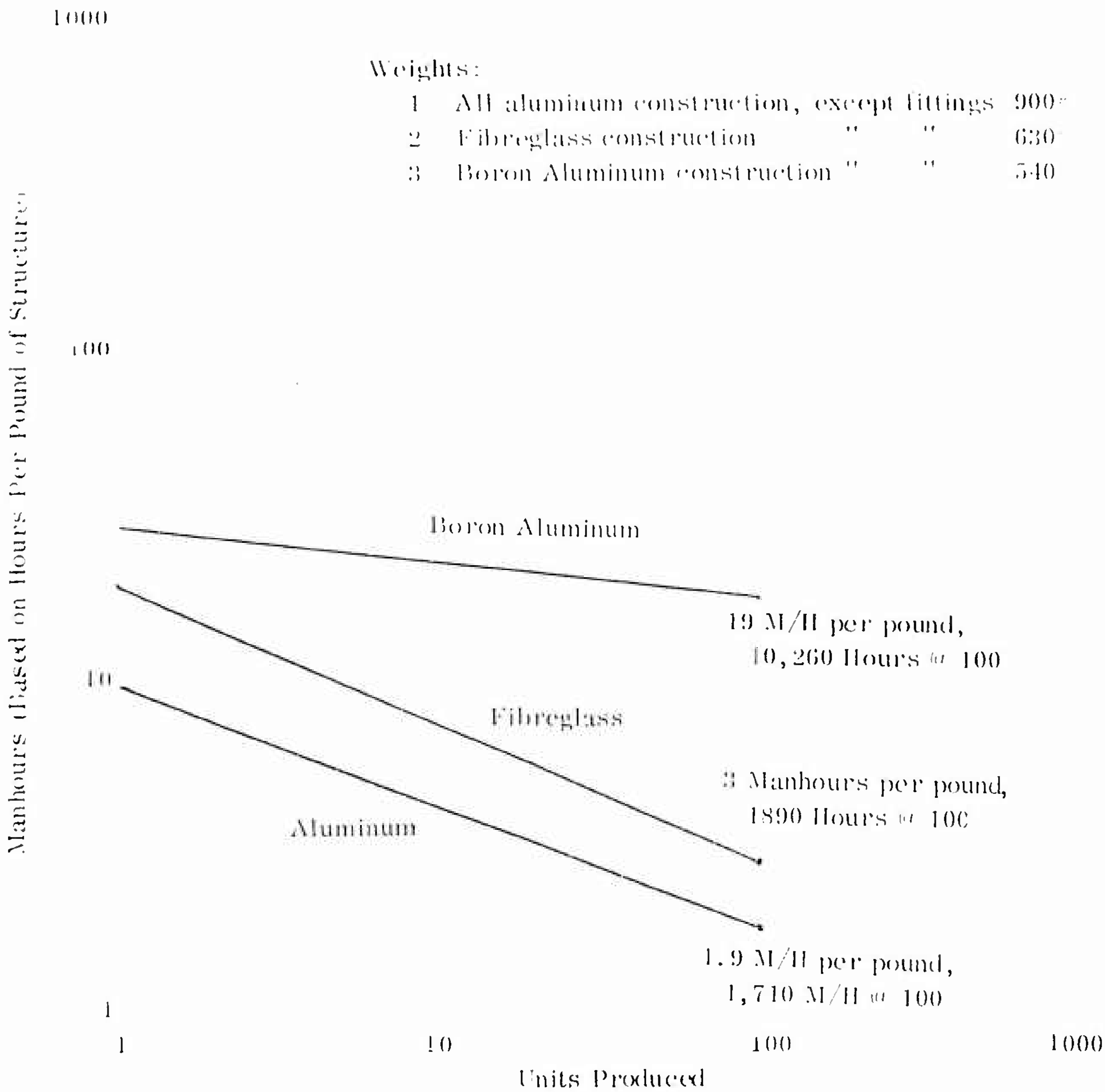


Notes: This is a simple structure assembly consisting of skins, doublers, frames, and is riveted. The assembly is tapered from inboard to outboard in straight elements. Design is similar to Convair 880.

The aluminum structure will experience a 78% learning curve. The fibreglass structure will experience a 88% learning curve. The Boron aluminum structure will experience a 92% learning curve. The last two flat curves are due to requirements for fixed cycles (cure/layup). Tolerance limitations result in a higher rejection/rework rate hence higher costs.

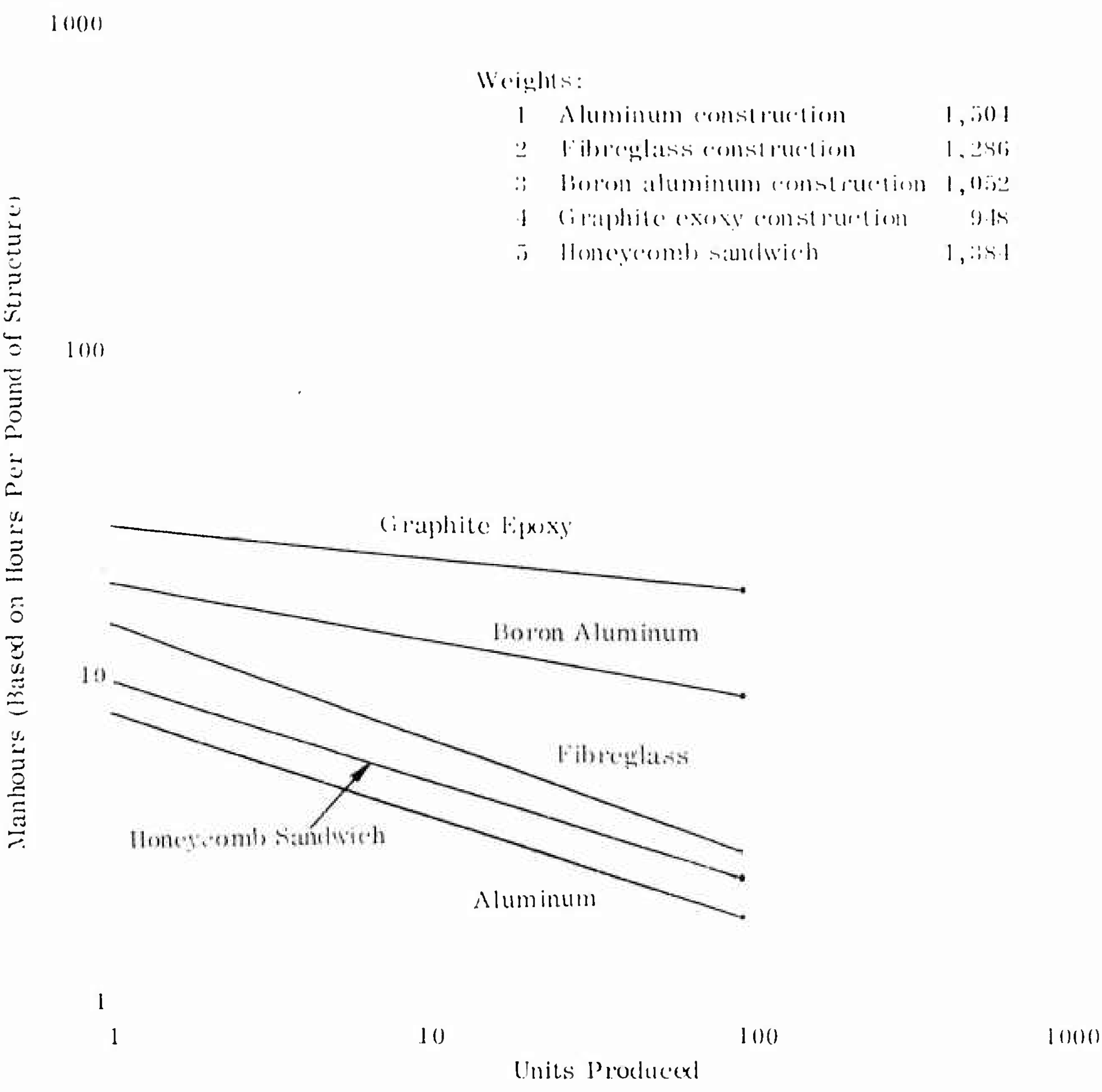
This assembly data is applicable to vertical and horizontal stabilizer assemblys where no rain erosion or antenna provisions are included.

Figure G-17. Wing Leading Edge Assembly.



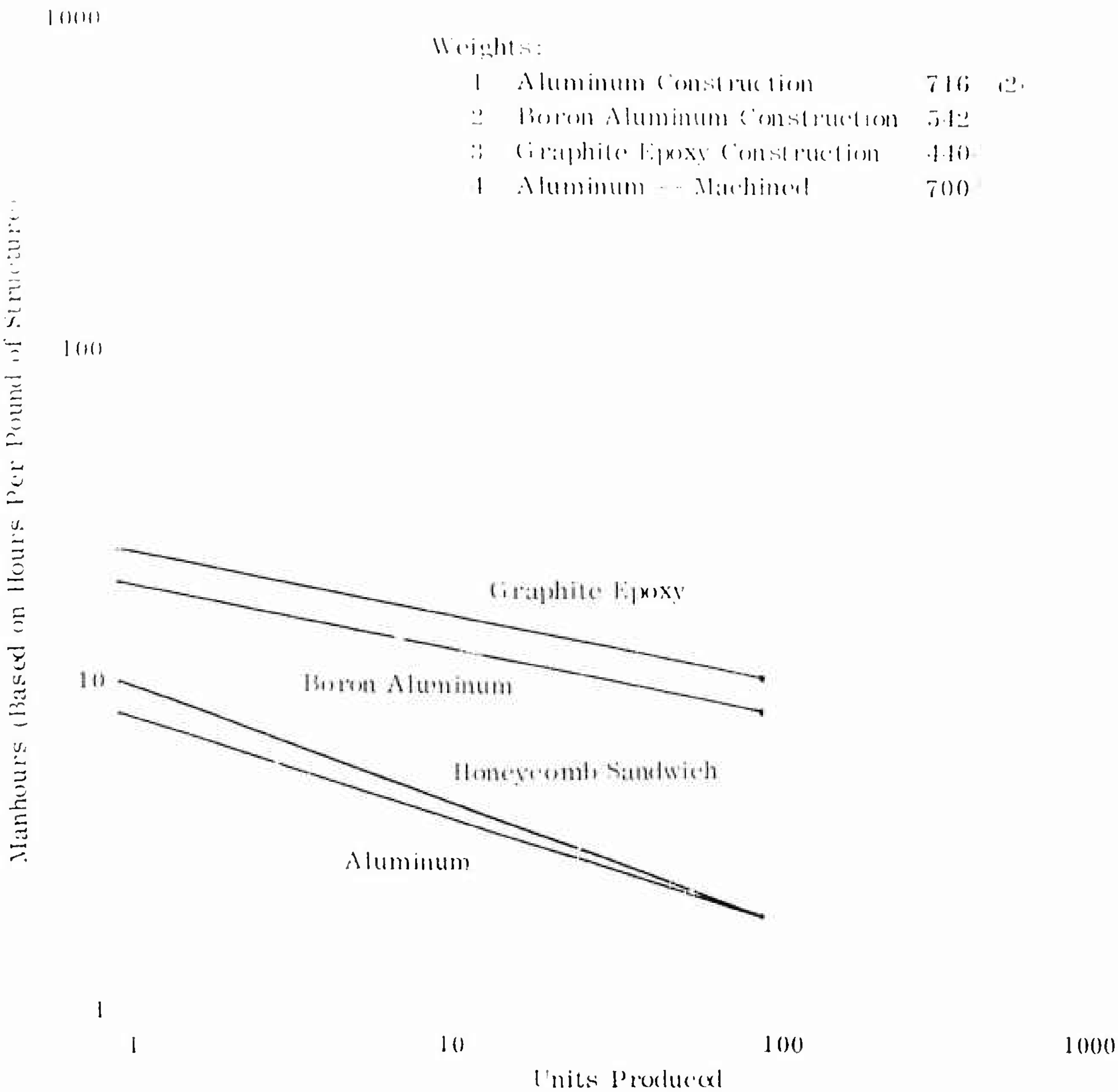
Note: This is a complex structure assembly with a leading edge slat and associated mechanisms included. Similar to the Convair 990 assembly.

Figure G-18. Wing Leading Edge Assembly.



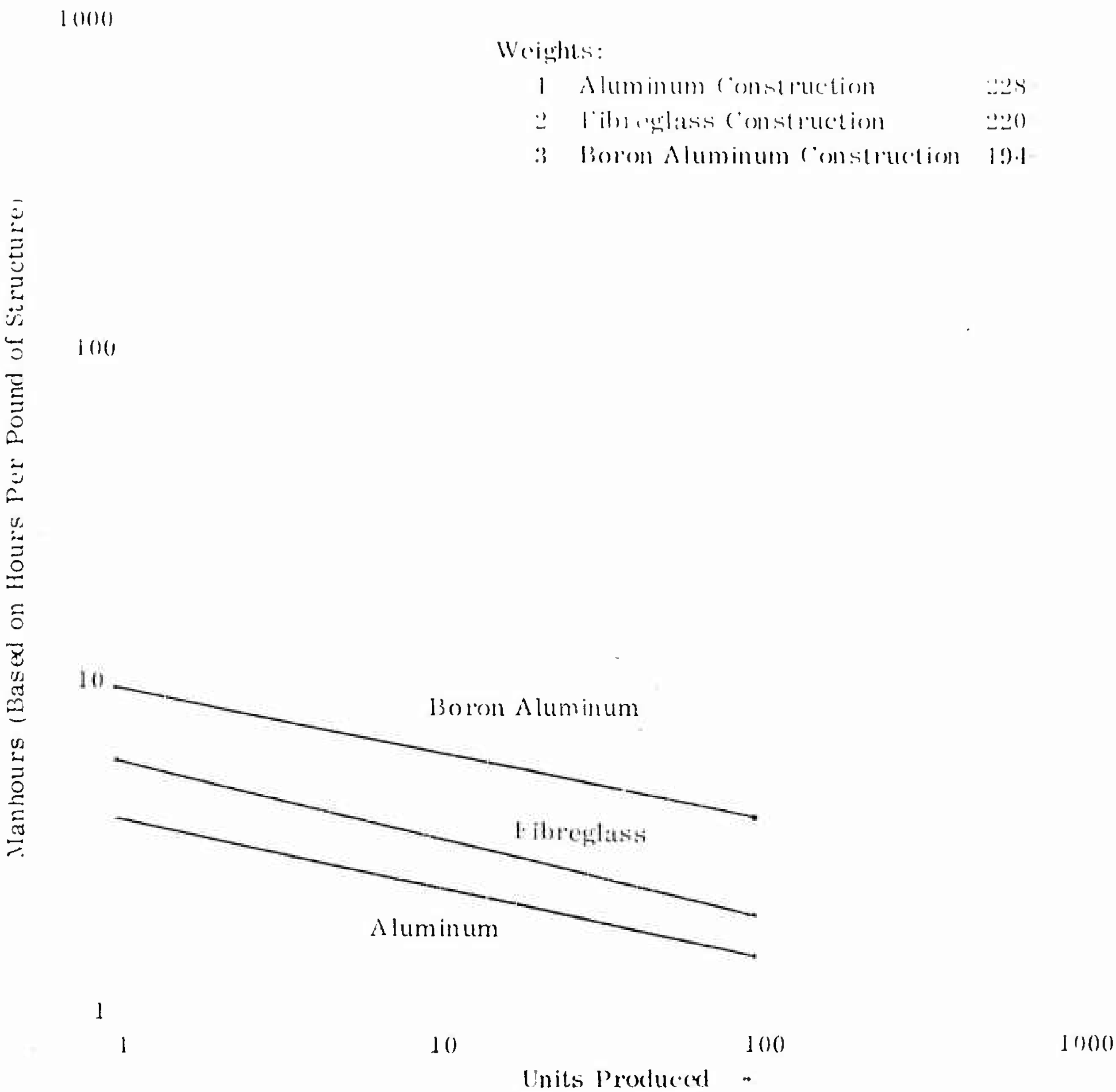
Note: Assembly is similar to the Convair 990.

Figure G-19. Wing Trailing Edge Assembly.



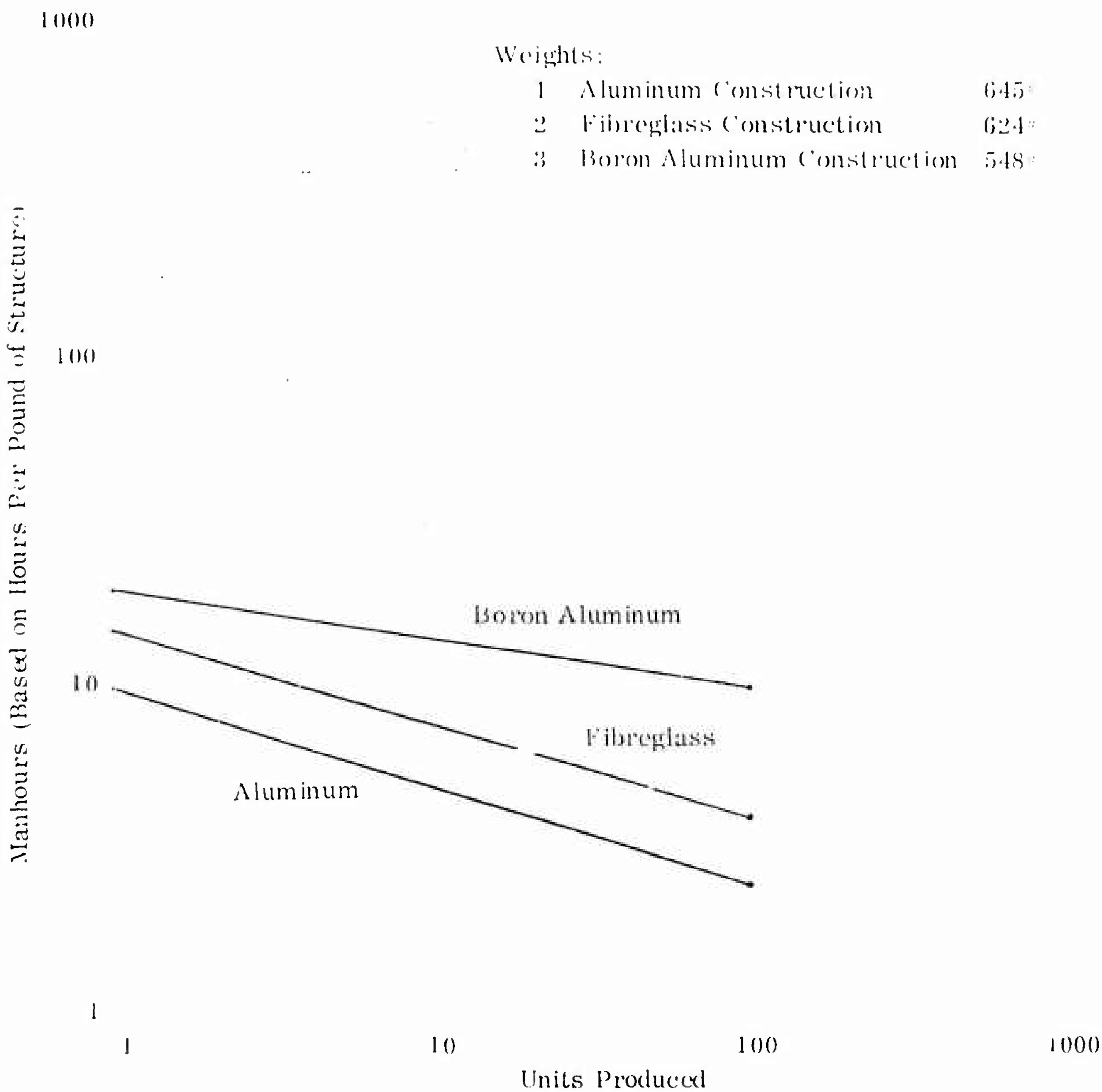
Note: Assembly is similar to the Convair 990.

Figure G-20. Aileron Assembly.



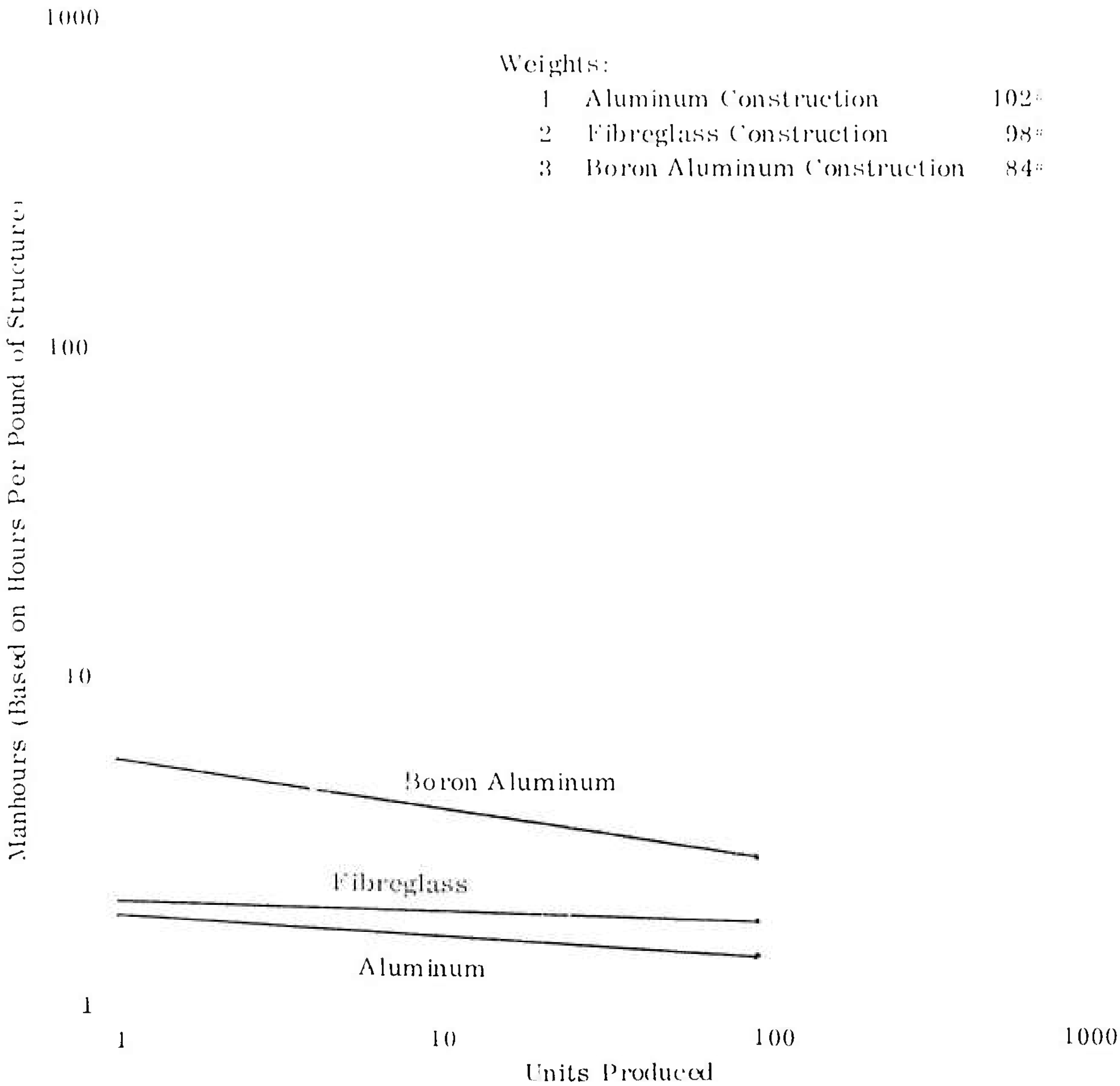
Note: Simple assembly similar to the Convair 990 wing to fuselage fairing

Figure G-21. Fairing Assembly - Simple.



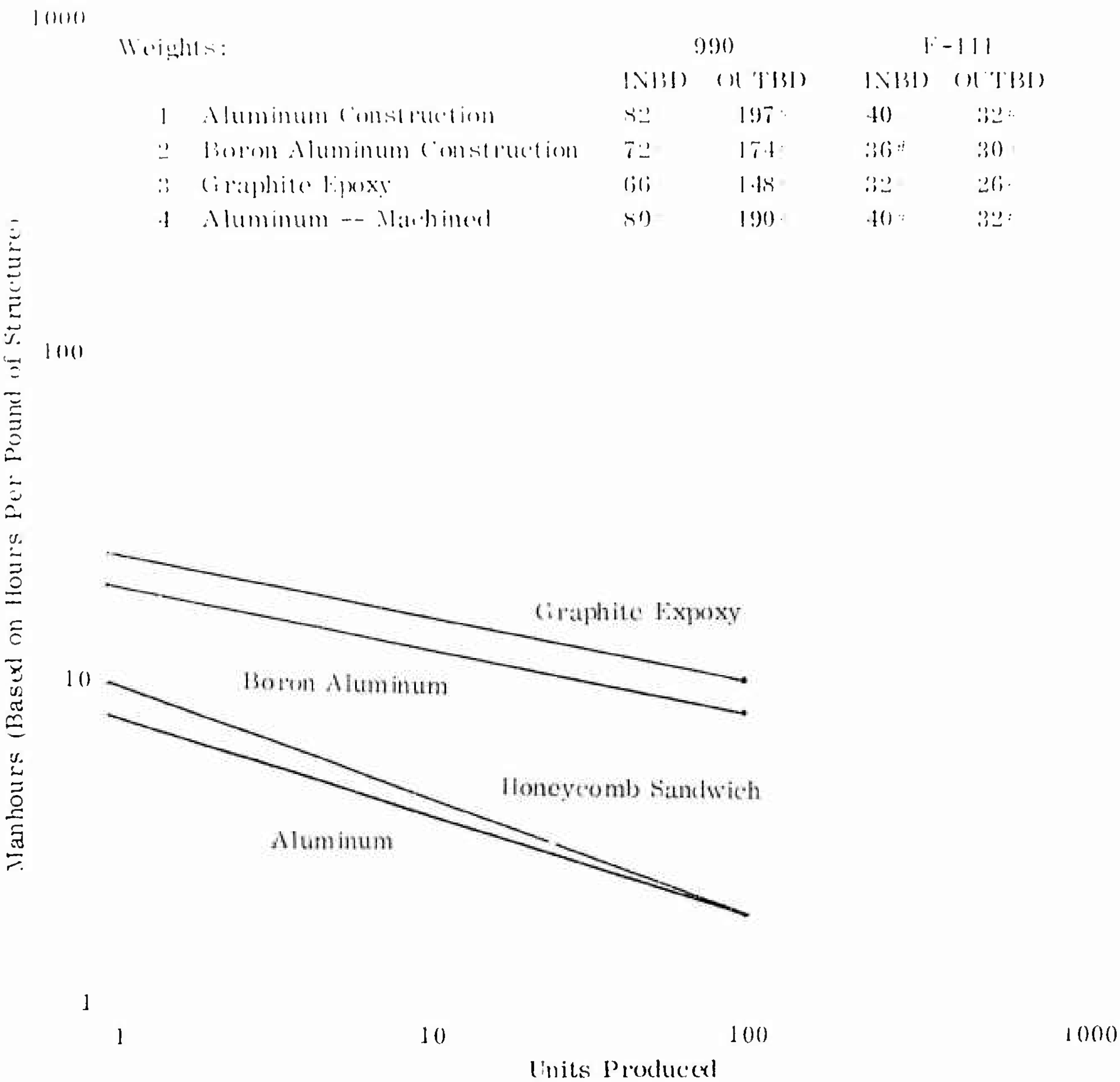
Note: Similar to the C-5A assembly.

Figure G-22. Fairing Assembly - Complex.



Note: Includes lighting and compass equipment similar to the Convair 990

Figure G-23. Wing Tip Assembly

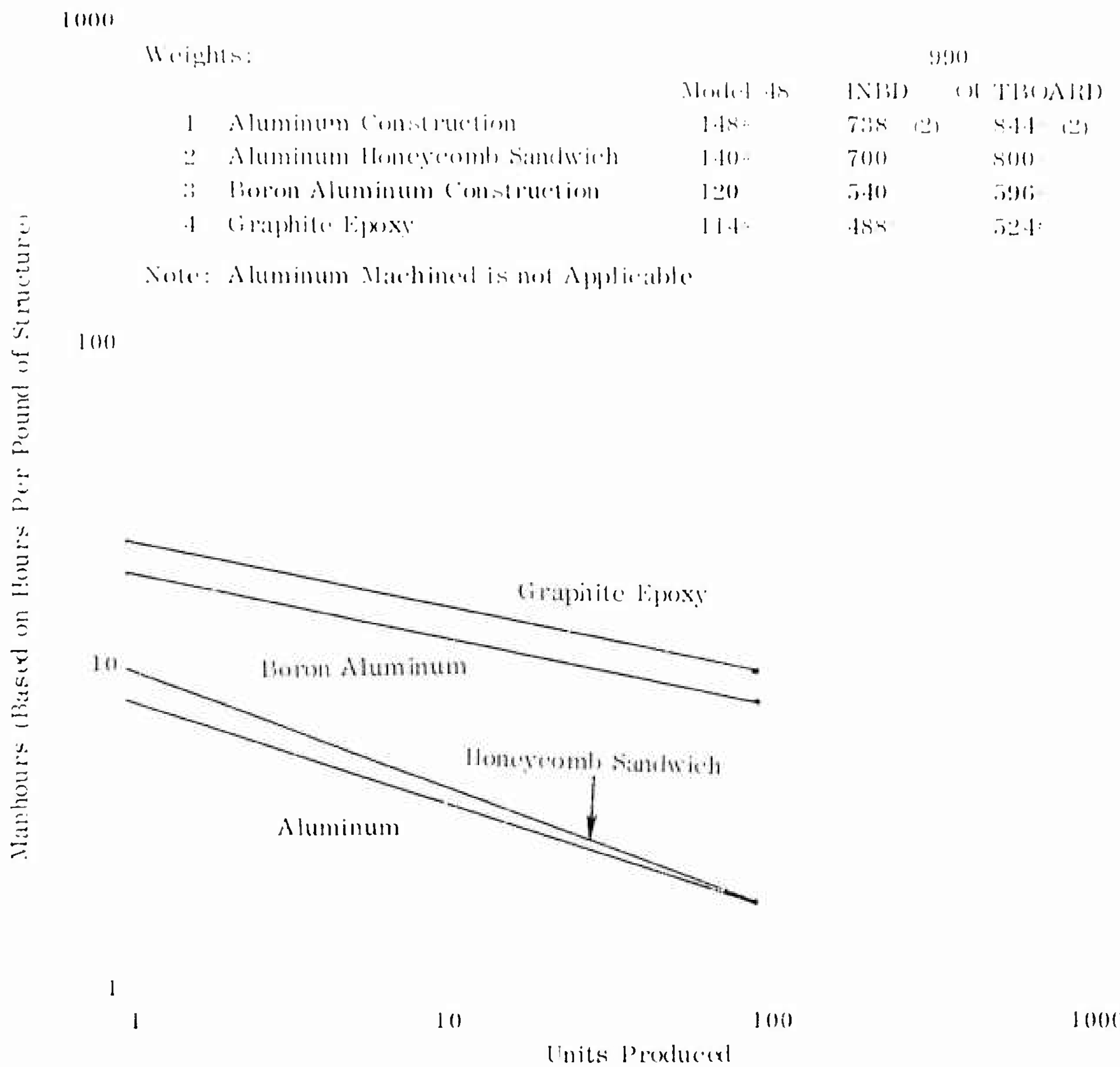


Weights:

		990		F-111	
		INBD	OUTBD	INBD	OUTBD
1	Aluminum Construction	82	197	40	32
2	Boron Aluminum Construction	72	174	36	30
3	Graphite Epoxy	66	148	32	26
4	Aluminum -- Machined	89	190	40	32

Note: Similar to the Convair 990 and the F-111

Figure G-24. Spoiler Assemblies.

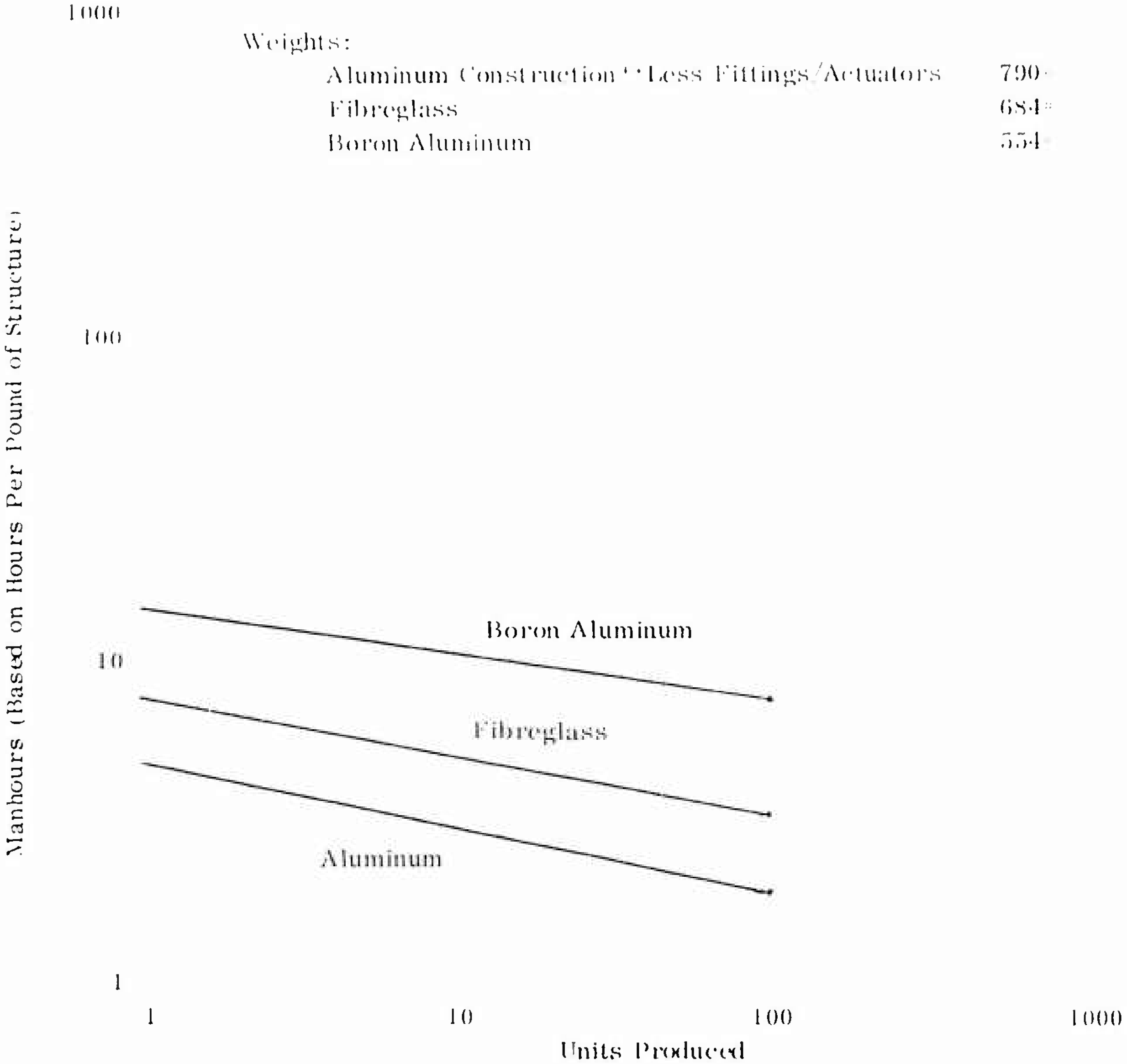


			990	
		Model 48	INBD	OUTBOARD
1	Aluminum Construction	148*	738* (2)	844* (2)
2	Aluminum Honeycomb Sandwich	140*	700	800*
3	Boron Aluminum Construction	120	540	596*
4	Graphite Epoxy	114*	488*	524*

Note: Aluminum Machined is not Applicable

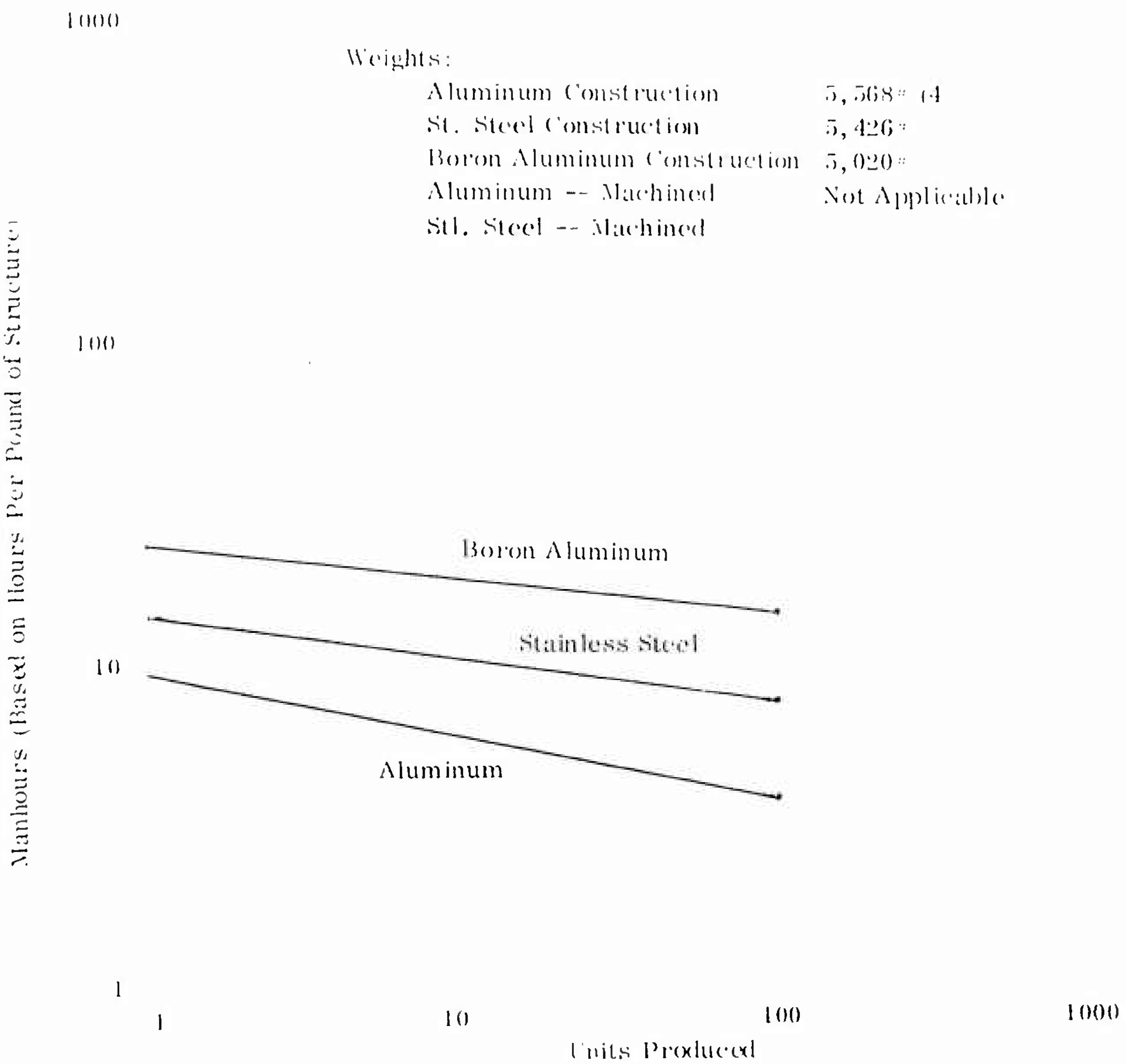
Note: Similar to the Convair 990 and the Model 48

Figure G-25. Flap and Flaperon Assemblies.



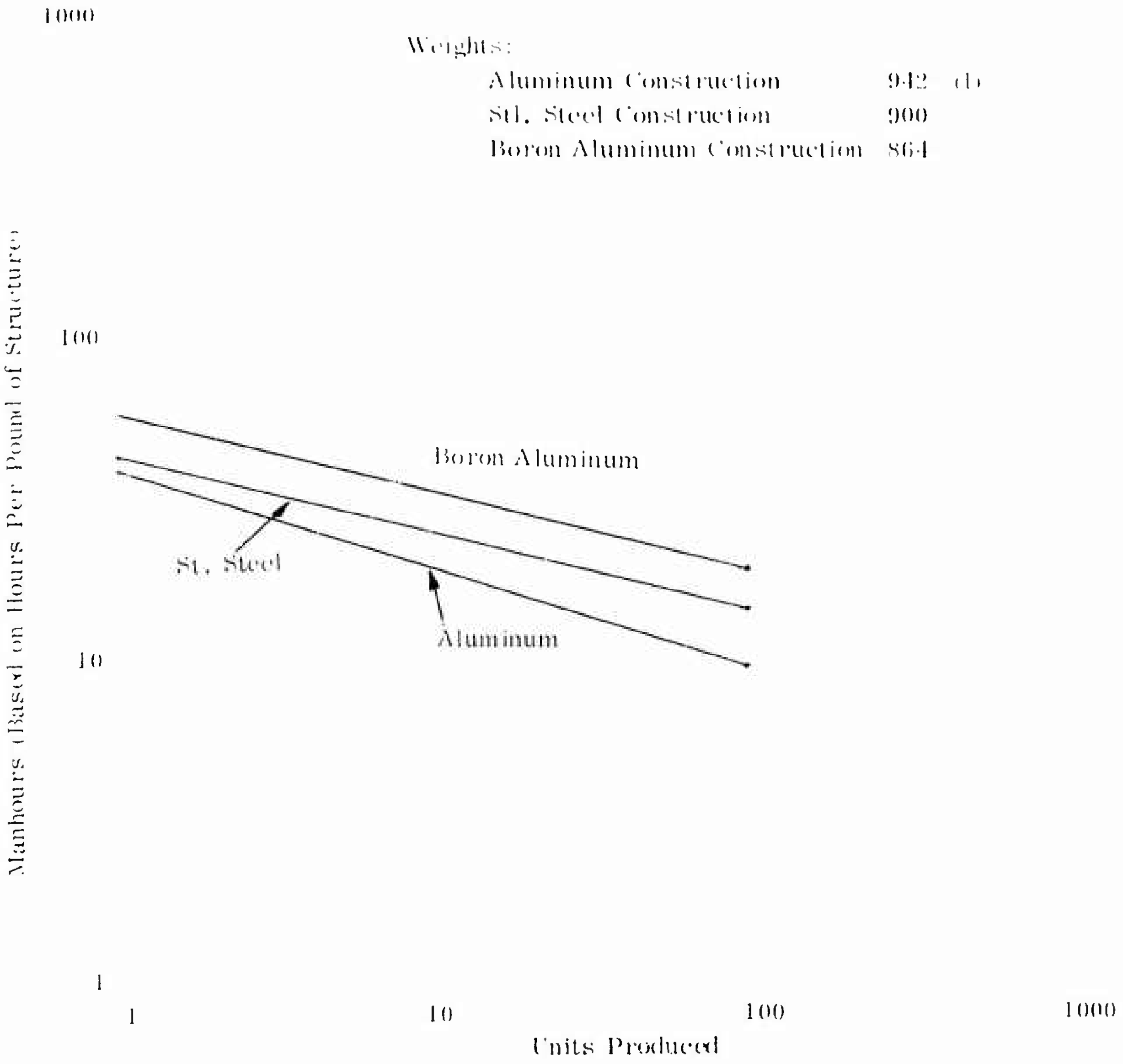
Note. Similar to the DC-10 Cargo Door C/F Version. Door is 76" × 120"

Figure G-26. Access Doors.



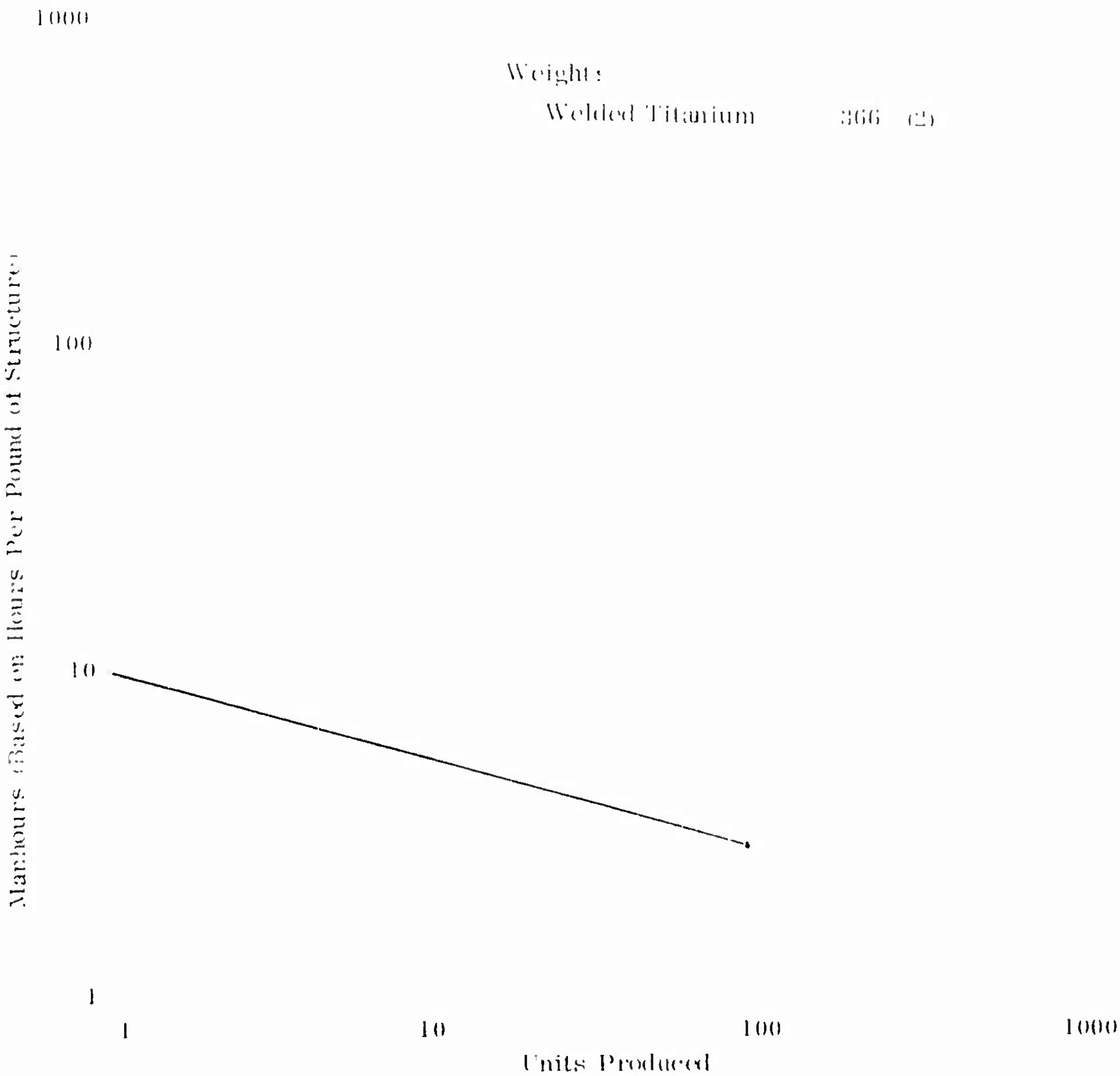
Note: Similar to the Convair 990 Pod Assembly (Relatively Simple)

Figure G-27. Wing Mounted Air Induction.



Note: Similar to the F-111 (Extremely Complex)

Figure G-28. Wing Mounted Air Induction.



Note: Concept for VSTOL aircraft - alternate materials not acceptable.

Figure G-29. Wing Mounted Air Duct.

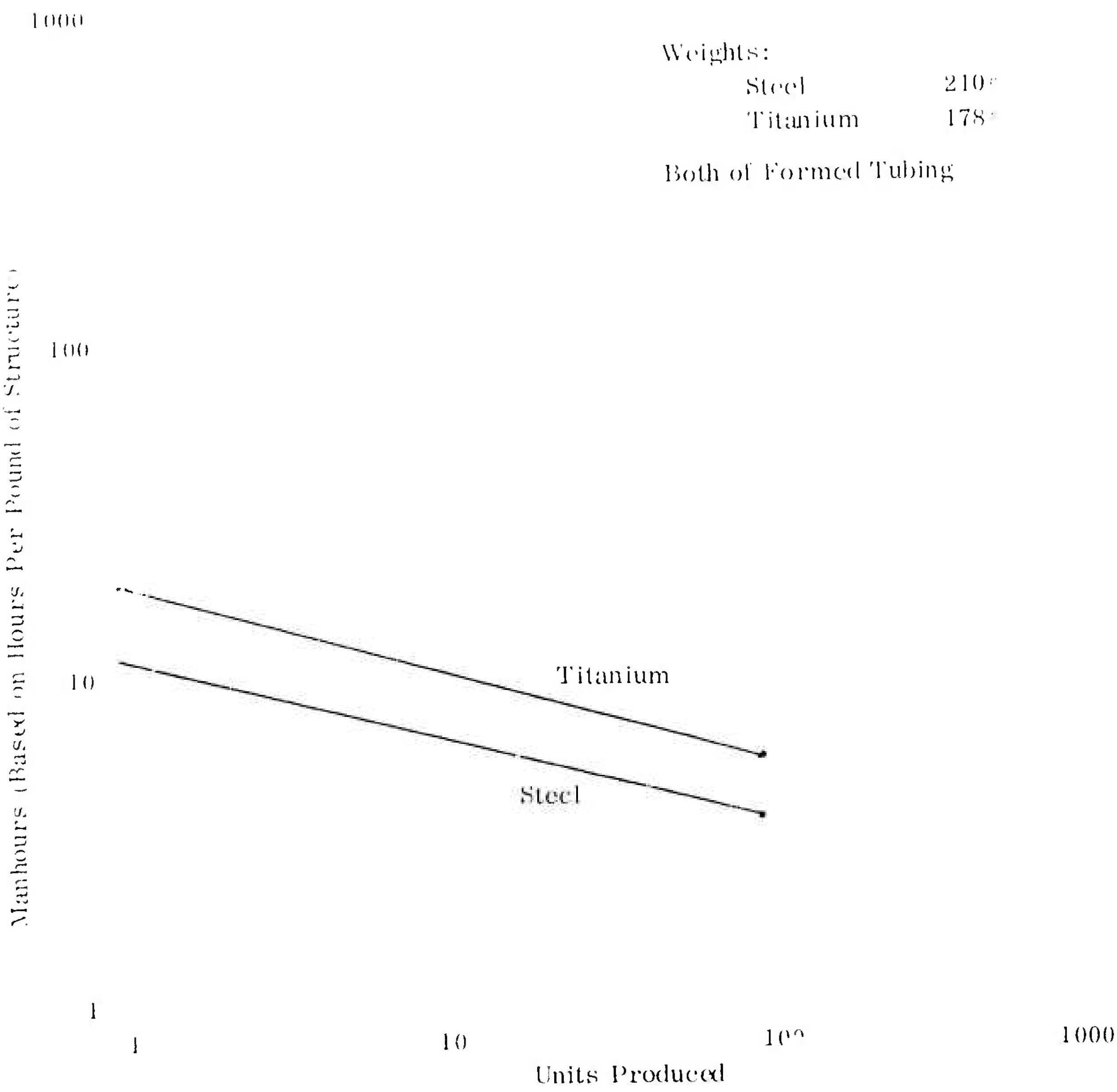
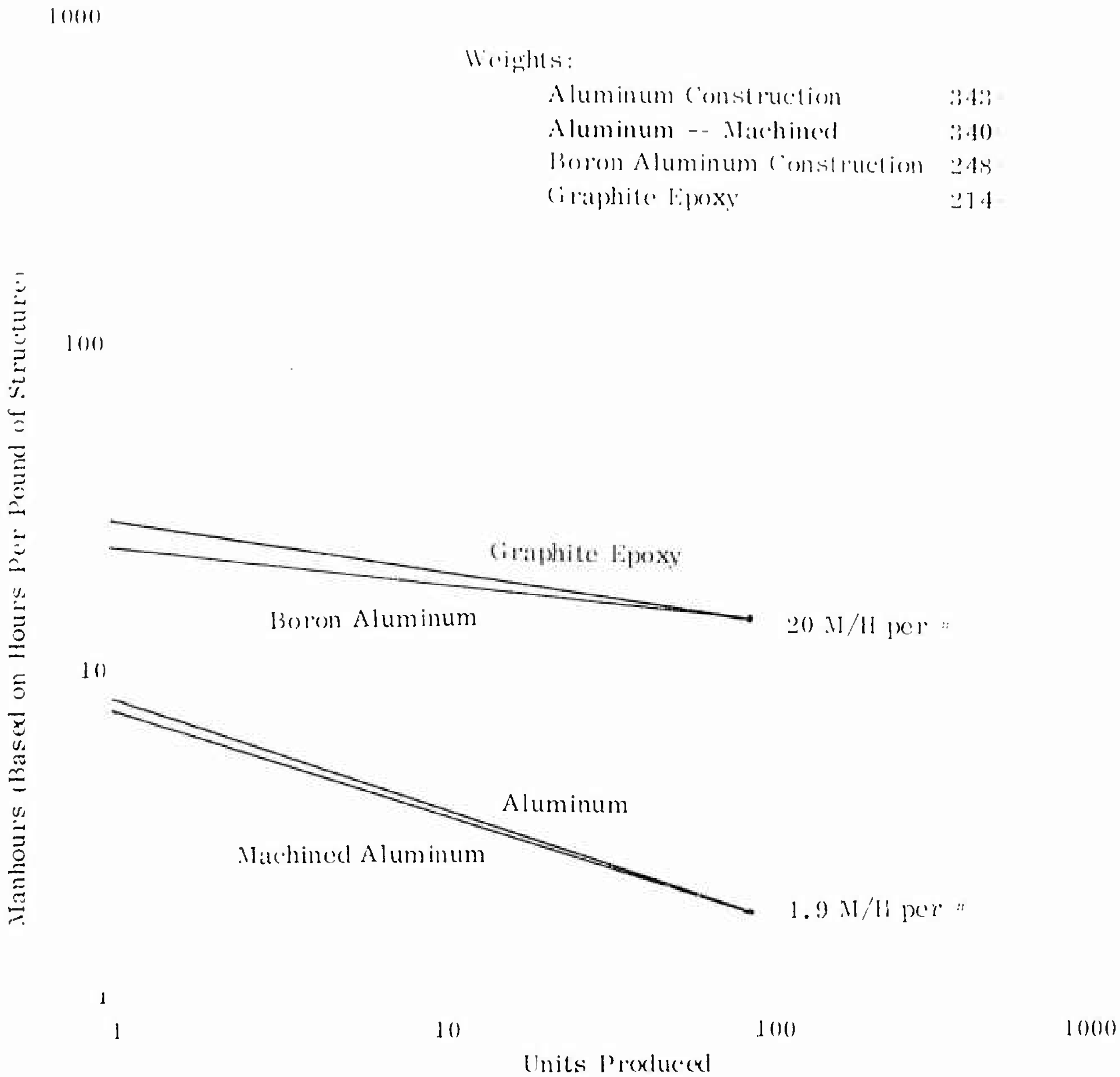
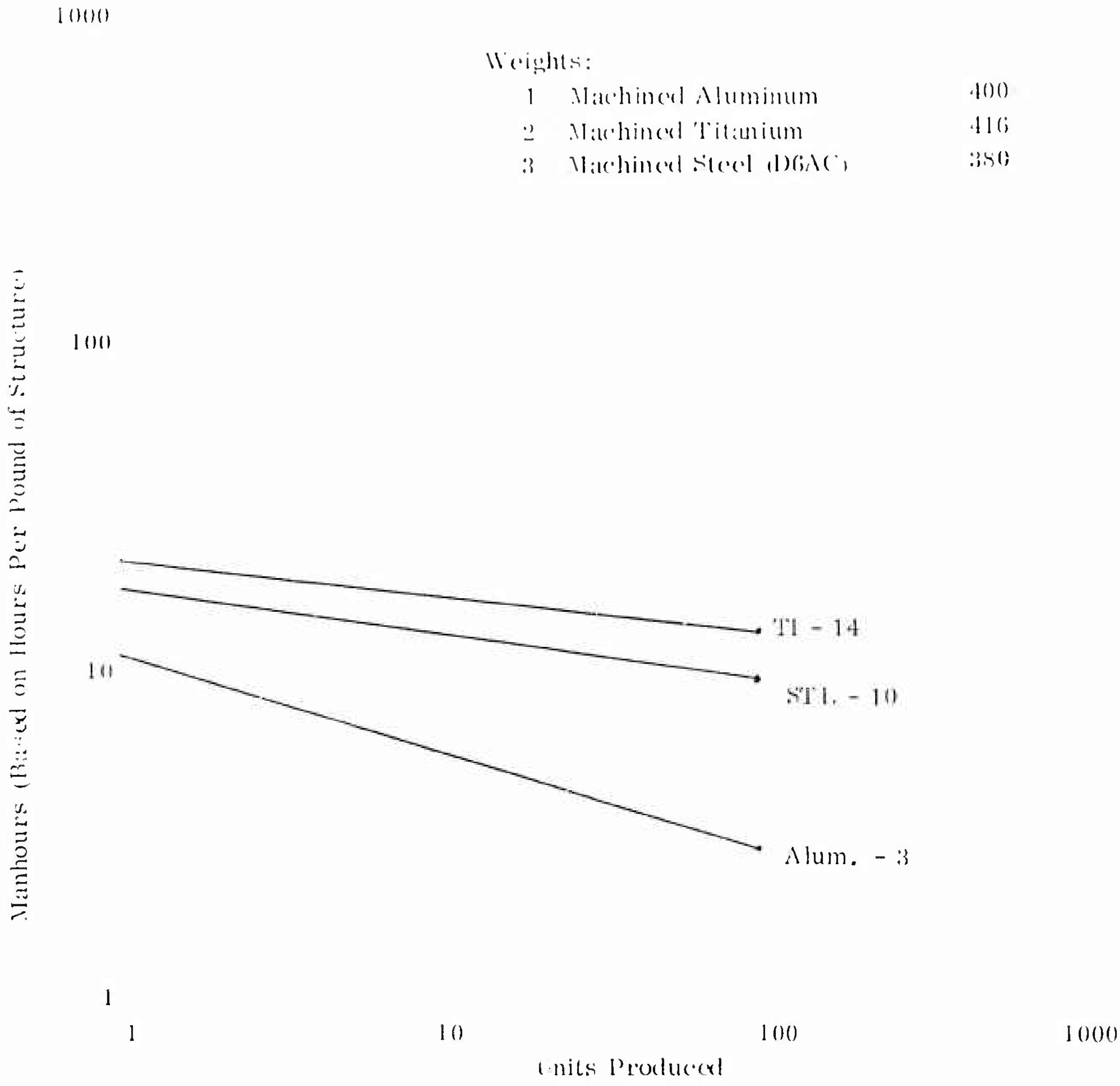


Figure G-30. High Lift Ducting.



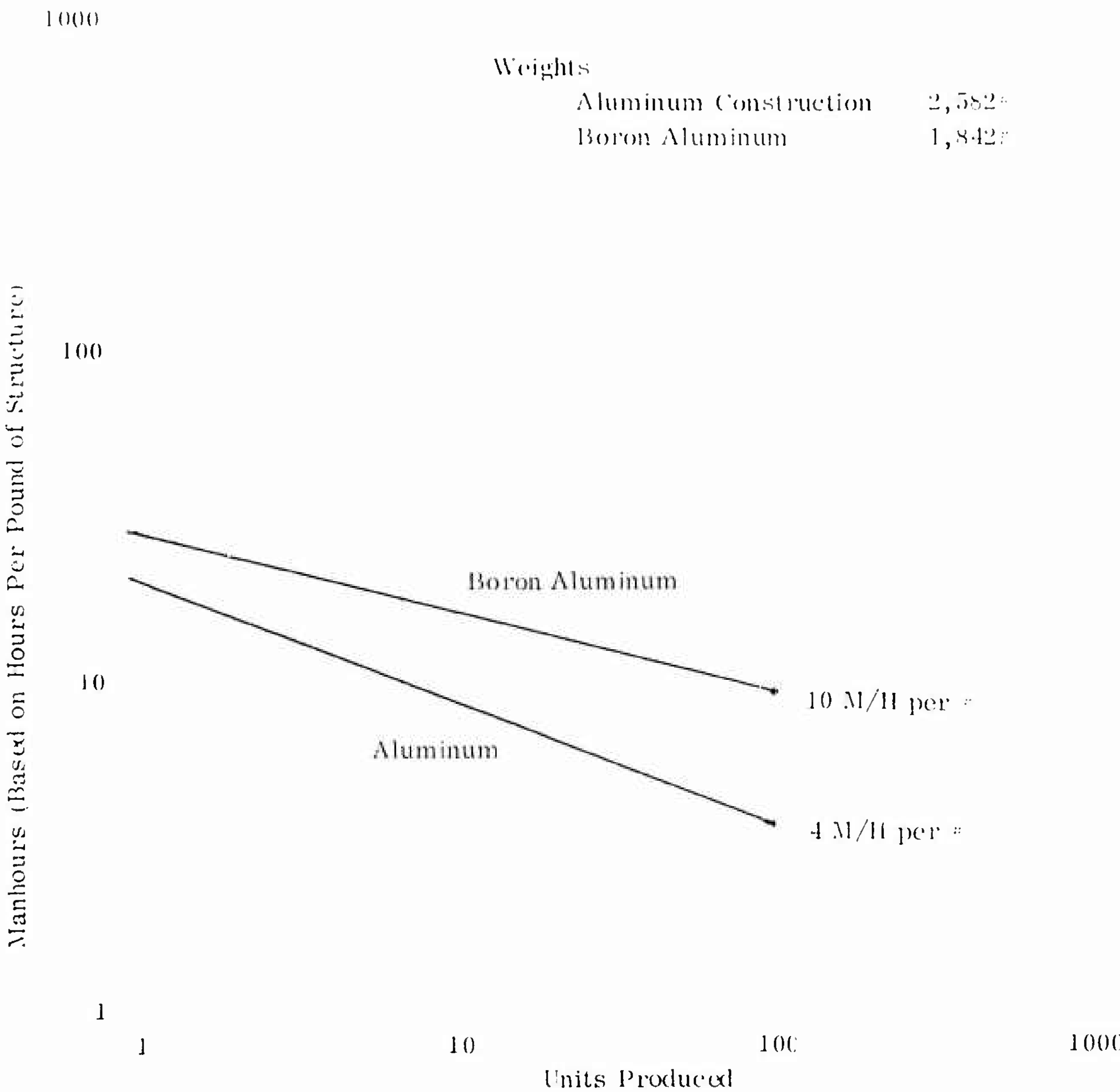
Note: Similar to the Convair 990

Figure G-31. Leading Edge Slats.



Note: Assumed to be skin panels, frames, ribs, etc. Similar to those used on the DC-10.

Figure G-32. Attachment Structure.

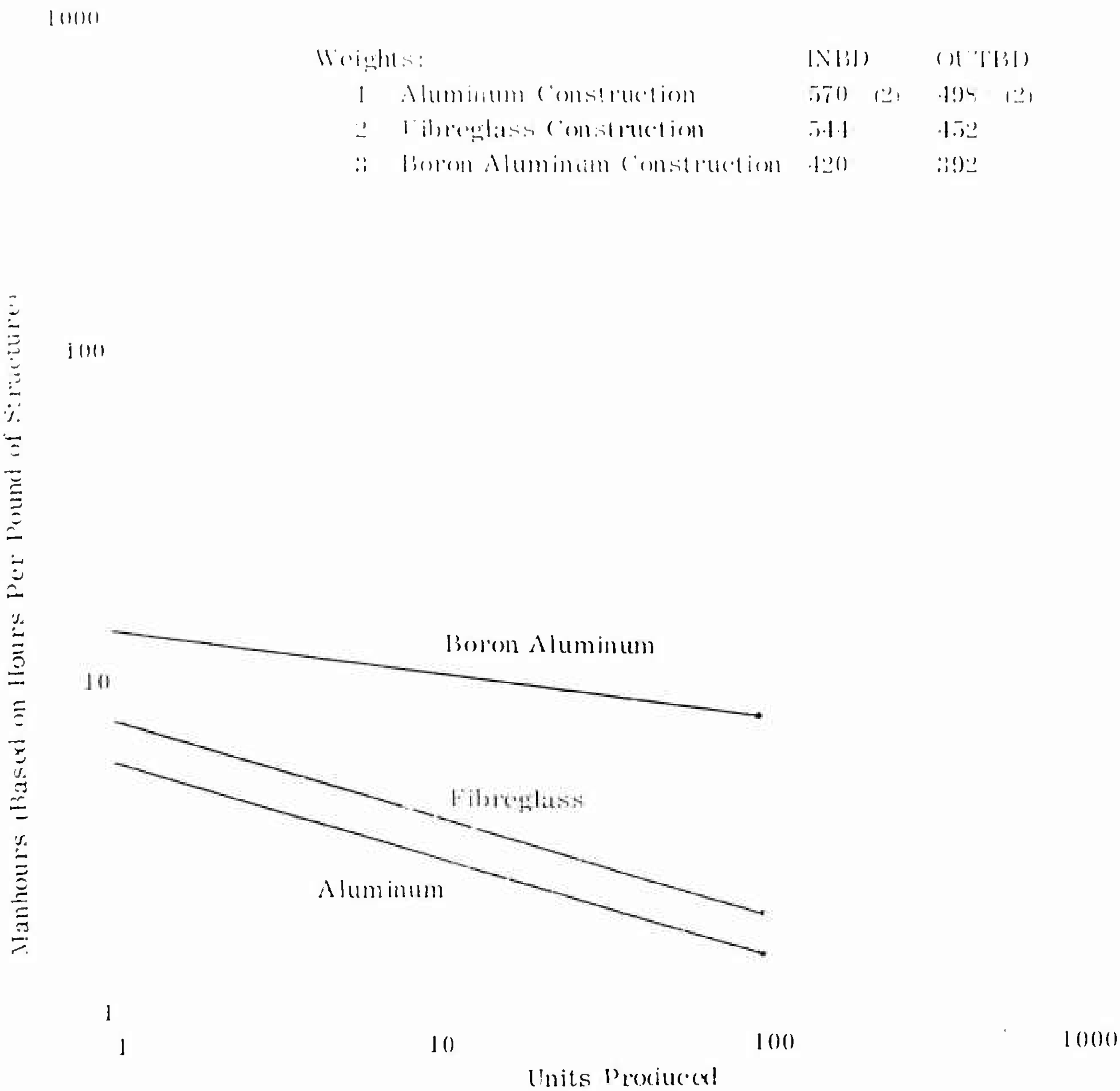


Note: Similar to the F-102/106

Figure G-33. Wing Center Section.

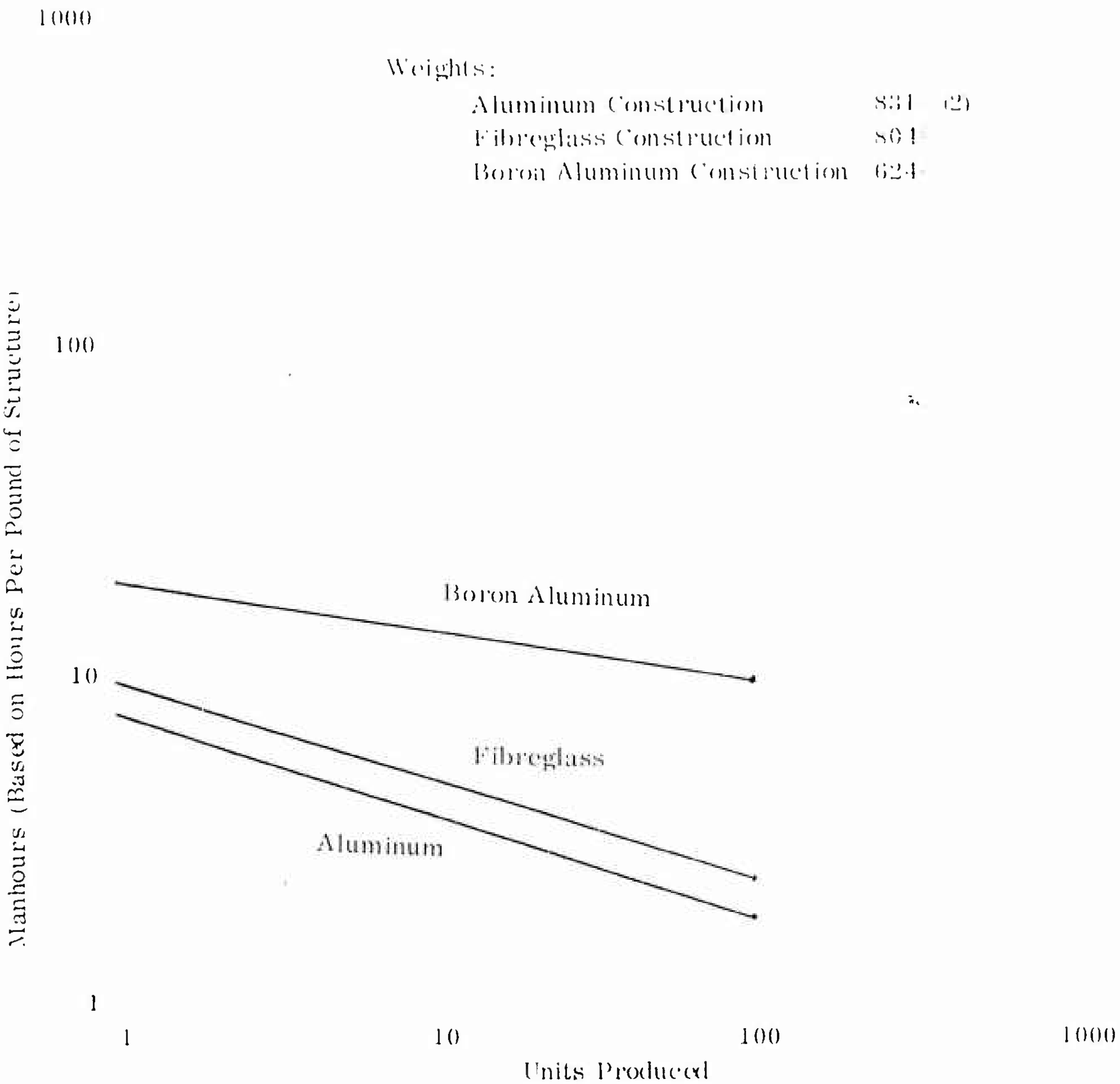
Weights:

		INBD	OUTBD
1	Aluminum Construction	570 (2)	498 (2)
2	Fibreglass Construction	544	452
3	Boron Aluminam Construction	420	392



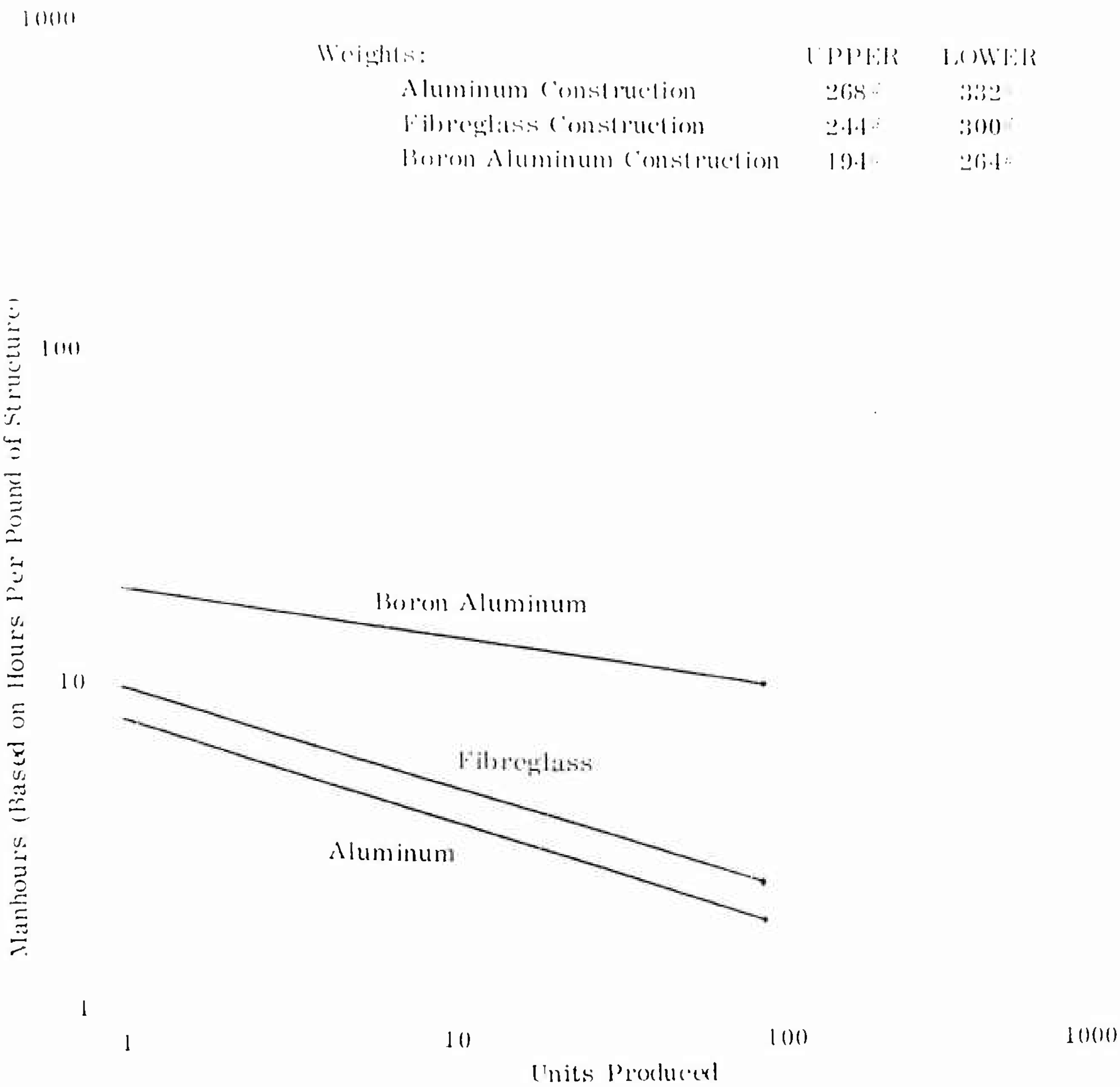
Note: Similar to the C-5A

Figure G-34. Elevators.



Note: Similar to the Convair 990 (Complex)

Figure G-35. Elevator Assemblies.



Note: Similar to the C-5A. The C-5A has a upper and a lower rudder system

Figure G-36. Rudder Assemblies.

forms a part of the basis for the conclusion that the derived cost estimating methods must necessarily be based on methods other than statistical. The results are shown in Table G-1.

The fuselage has not been similarly analyzed.

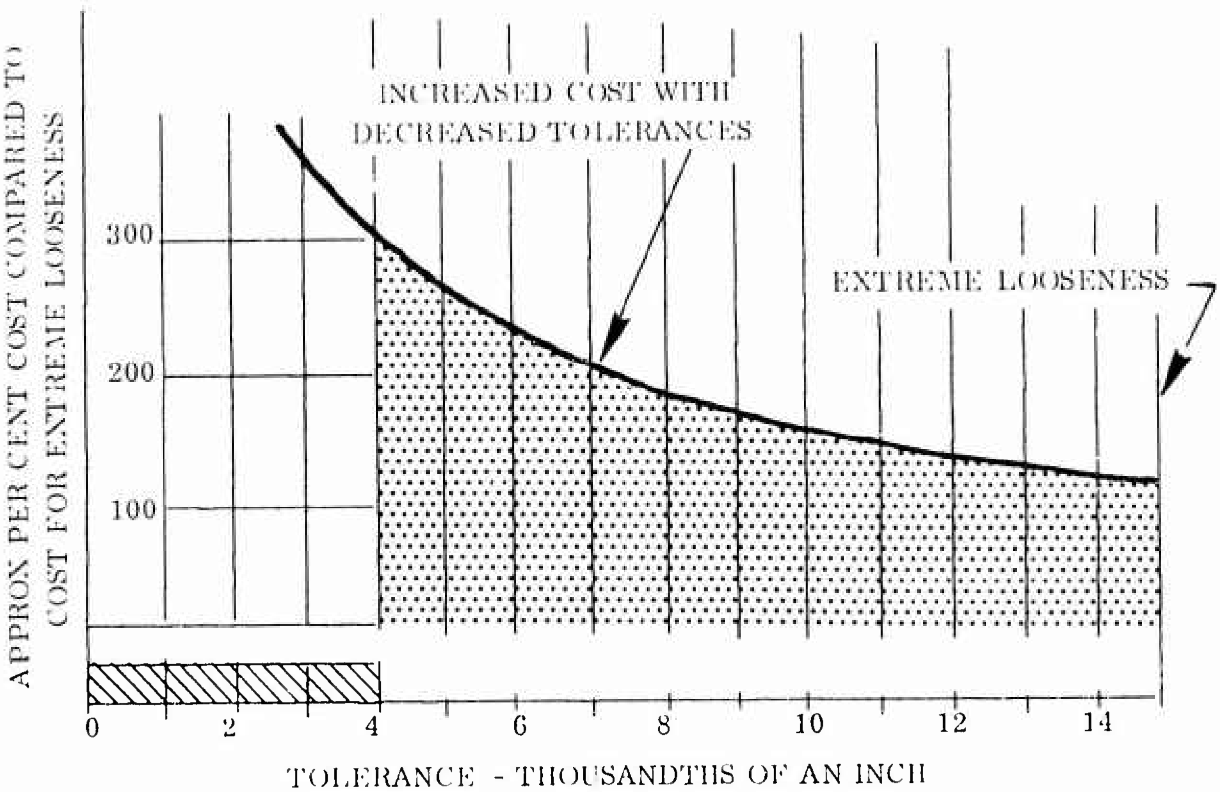


Figure G-37. Effect of Tolerance.

Table G-1. Types of Material and Construction Techniques — Aerodynamic Surfaces

	Wing			Secondary Structure	Horizontal			Secondary Structure
F-111	Ribs	Spars	Covers		Ribs	Spars	Covers	
Construction	Integral Web Stiffener	Integral Web Stiffener	Machined Plate		Honeycomb Core	Integral Web Stiffener	Machined Plate	
Material	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum
A-X								
Construction	Built Up Web Stiffener	Built Up Web Stiffener	Built Up Skin Stringer		Built Up Web Stiffener	Built Up Web Stiffener	Sheet	
Material	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum
C-141								
Construction					Built Up and Integral Truss	Built Up Web Stiffener	Built Up Skin Stringer	
Material					Aluminum	Aluminum	Aluminum	Aluminum
C-5A								
Construction					Built Up Truss	Built Up Web Stiffener	Integral Skin Stringer	
Material					Aluminum	Aluminum	Aluminum	Aluminum
VSX								
Construction	Built Up Truss	Built Up Web Stiffener	Built Up Skin Stringer		Built Up Web Stiffener	Built Up Web Stiffener	Sheet	
Material	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum
AFX								
Construction	Integral Web Stiffener	Integral Web Stiffener	Machined Plate	L. E. & T. E. Fiberglass Slats, Flaps	Sheet Web	Sheet Web	Integral Skin Stringer	L. E. & T. E. Aluminum Fiberglass F. D. Core Sand.
Material	Titanium	Titanium	Titanium	Spoilers, Alum. Skin F. D. Core Sandwich, Phenolic	Titanium	Titanium and Aluminum	Titanium and Aluminum	Tip Boron Epoxy F. D. Core Sandwich
B-52 Outer Wing Panel								
Construction	Built Up Web Stiffener	Built Up Truss	Machined Plate					
Material	Aluminum	Aluminum	Aluminum	Aluminum				

TYPES OF MATERIAL AND CONSTRUCTION TECHNIQUES
AERODYNAMIC SURFACES

	Wing			Secondary Structure	Horizontal			Secondary Structure
	Ribs	Spars	Covers		Ribs	Spars	Covers	
880								
Construction	Built Up Truss	Built Up Web Stiffener	Built Up Skin Stringer		Built Up Truss	Built Up Web Stiffener	Built Up Skin Stringer	
Material	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum
990								
Construction	Built Up Truss	Built Up Web Stiffener	Built Up Skin Stringer		Built Up Truss	Built Up Web Stiffener	Built Up Skin Stringer	
Material	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum

TYPES OF MATERIAL AND CONSTRUCTION TECHNIQUES
AERODYNAMIC SURFACES

	Vertical			Secondary Structure
F-111	Ribs	Spars	Covers	
Construction	Integral Web Stiffener and Integral Truss	Integral Web Stiffener	Machined Plate	
Material	Aluminum	Aluminum	Aluminum	Aluminum
A-X				
Construction	Built Up Web Stiffener	Built Up Web Stiffener	Sheet	
Material	Aluminum	Aluminum	Aluminum	Aluminum
C-141				
Construction	Built Up and Integral Truss	Built Up and Integral Truss Sheet Web	Built Up Skin Stringer	
Material	Aluminum	Aluminum	Aluminum	Aluminum
C 5				
Construction	Built Up Truss	Built Up Web Stiffener	Integral Skin Stringer	
Material	Aluminum	Aluminum	Aluminum	Aluminum
VSX				
Construction	Built Up Web Stiffener	Built Up Web Stiffener	Sheet	
Material	Aluminum	Aluminum	Aluminum	
VFX				
Construction	Sheet Web	Forgings	Machined Plate	L. E., Rudder
Material	Aluminum	Titanium	Titanium & Aluminum	Aluminum Built Up Web Stiffener

FORM ... REV 6-61

TYPES OF MATERIAL AND CONSTRUCTION TECHNIQUES
AERODYNAMIC SURFACES

	Vertical			Secondary Structure
880	Ribs	Spars	Covers	
Construction	Built Up	Built Up Web	Built Up Skin	
	Truss	Stiffener	Stringer	
Material	Aluminum	Aluminum	Aluminum	Aluminum
990				
Construction	Built Up	Built Up Web	Built Up Skin	
	Truss	Stiffener	Stringer	
Material	Aluminum	Aluminum	Aluminum	Aluminum

APPENDIX II

MATERIAL COST ESTIMATING COEFFICIENTS

Appendix II is concerned with the back-up data for estimating material costs in the categories of:

a. Material costs for basic structure.

b. Material costs for secondary structure.

c. Basic structure assembly material costs.

e. Component assembly material costs.

The first category involves the terms RMC_i, SF_i, and G and relates to Tables 31 and 32. The development of these is based on Figures II-1 and II-2. The lower line in Figure II-1 represents the lowest expected cost per pound for rib, spar, or cover constructions made of aluminum. In this case, the sheet cover was the lowest cost example. The input value (RMC) for the equation is found by extrapolating this line to the one pound intercept. At one pound, the values for aluminum and titanium are found to be $18.00 and $28.00 per pound, respectively. Weight of the component is determine from a weight analysis, but the scaling value exponent G, is the negative inverse of the slope of the lines in Figure II-1, with a value of 0.77.

Sheet stock cost for sheet design covers is taken as the reference cost. This is represented by the solid line in Figure II-1. Even in the sheet cover design there is loss of material due to cutting and minimal chem-milling. As the weight of stock required goes up, the cost approaches the purchase price for standard aluminum stock at the mill, which is around 60 cents per pound. Mill prices are, of course, higher for non-standard stock, special processing, and small orders. Differences between mill prices and costs indicated by the solid line are due to actual scrappage from cut-off, machining drilling, etc., as well as costs of shipping, receiving inspection, inventory storage, and a portion of material control and handling costs. The other extreme, as opposed to sheet covers with a scrappage factor of 1.0, are the integrally machined items with a scrappage factor of 5.3. This value is found from Figure II-1 data. Values in Table 32 are averages of available data. In general, it is expected that spars will have a larger aluminum scrappage factor than ribs for built-up construction types because of the tapered spar caps. The reverse is expected for titanium because the loss for taper milling is exceeded by the greater cost penalty in titanium of ordering the numerous different gauges and stock sizes required for a set of ribs. Some of

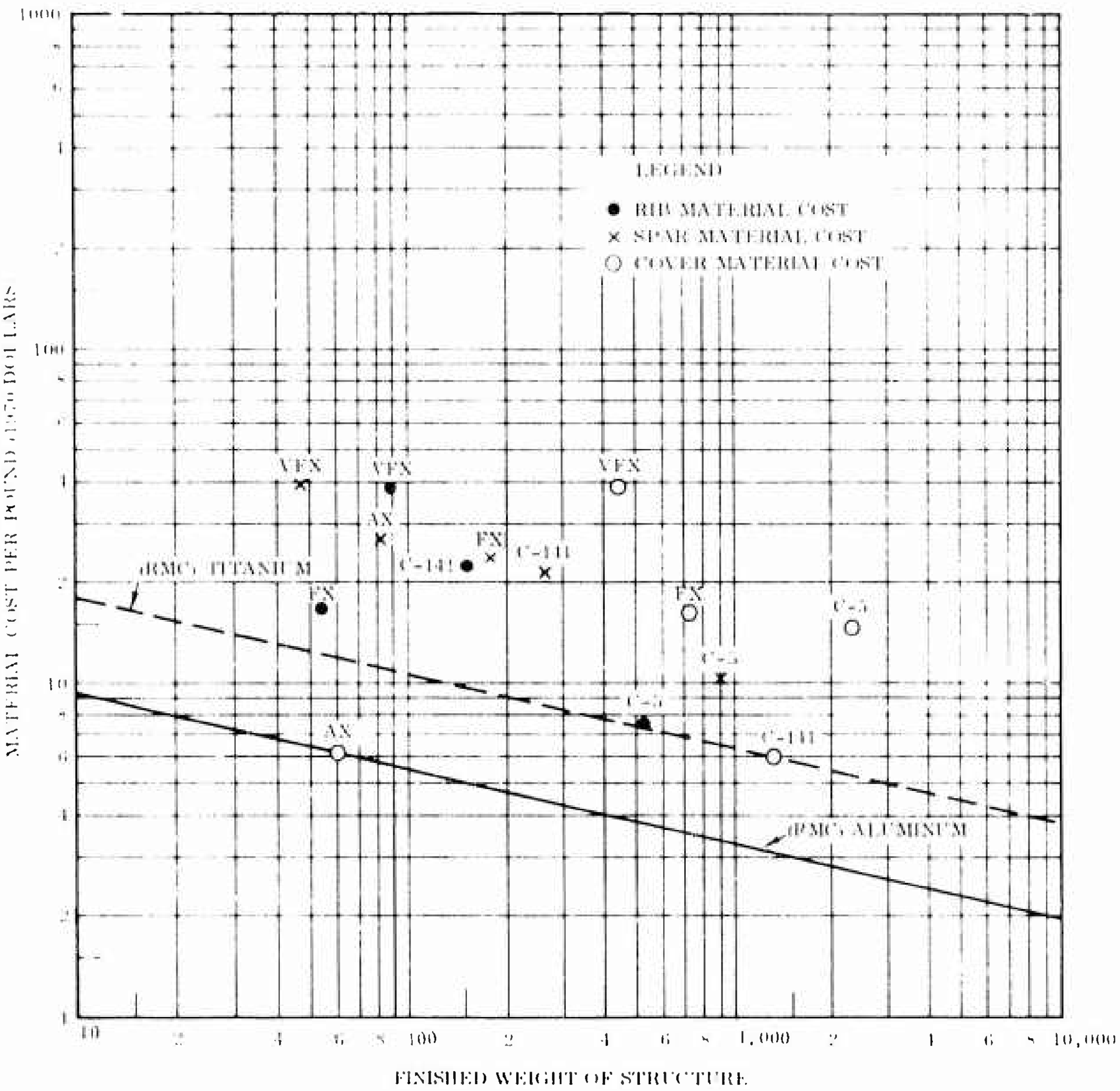


Figure H-1. Rib, Spar, and Cover Cost per Pound Versus Structure Weight.

the factors of Table 32 are based on judgment due to lack of specific data. The Figure H-2 shows a plot of normalized values which are obtained by dividing the data values by the appropriate scrappage factor. It is seen that all but three of the normalized values for aluminum fit the aluminum line, and the three available titanium values provide a good fit to the titanium line. The FX rib point, the AX spar point and the C-141 spar point are off the line. No explanation is available for these discrepancies except to say that some abnormalities toward the high side can be expected from actual data.

The slope of the aluminum and the titanium lines represent a fit to the normalized data. The exponential slope value is .77, the value of G. Material cost scaling lines for graphite epoxy and boron epoxy are also included in Figure H-2. The slopes of these two lines are not verified by data but it is noted that slopes must decrease or else predicted composite material costs will fall below vendor prices. Slopes of .98 for boron epoxy and .95 for graphite epoxy are shown.

The second category, material costs for secondary structure, involves the above terms and the same CER form applied to secondary structure. The input values used are shown in Tables 33, or in the case of SF, preset as 1.

Figure H-3 shows data for the categories of costs noted in Table 33. These categories represent material costs for a miscellany of subassemblies. Three lines are drawn in Figure H-3 representing the prediction equations for secondary structure and other structure material cost categories. The three lines have the same slope as was seen in Figure H-2. These material cost categories are higher than those shown in Figure H-2 because costs for fasteners and other assembly materials are included in addition to the base structure material costs.

The third category, basic structure assembly material costs, involves the terms AMF1 and FM1, which are covered by Tables 35 and 36, respectively. Figure H-4 is the basis for AMF1 and FM1. Limited data is shown. The C-141 and A(X) use aluminum fasteners, the C-5A, titanium. The intermediate values are based on judgement.

The fourth category, component assembly material costs, involves the terms AMF2 and FM2 in Tables 35 and 36, respectively. Figure H-5 is the basis for the values used.

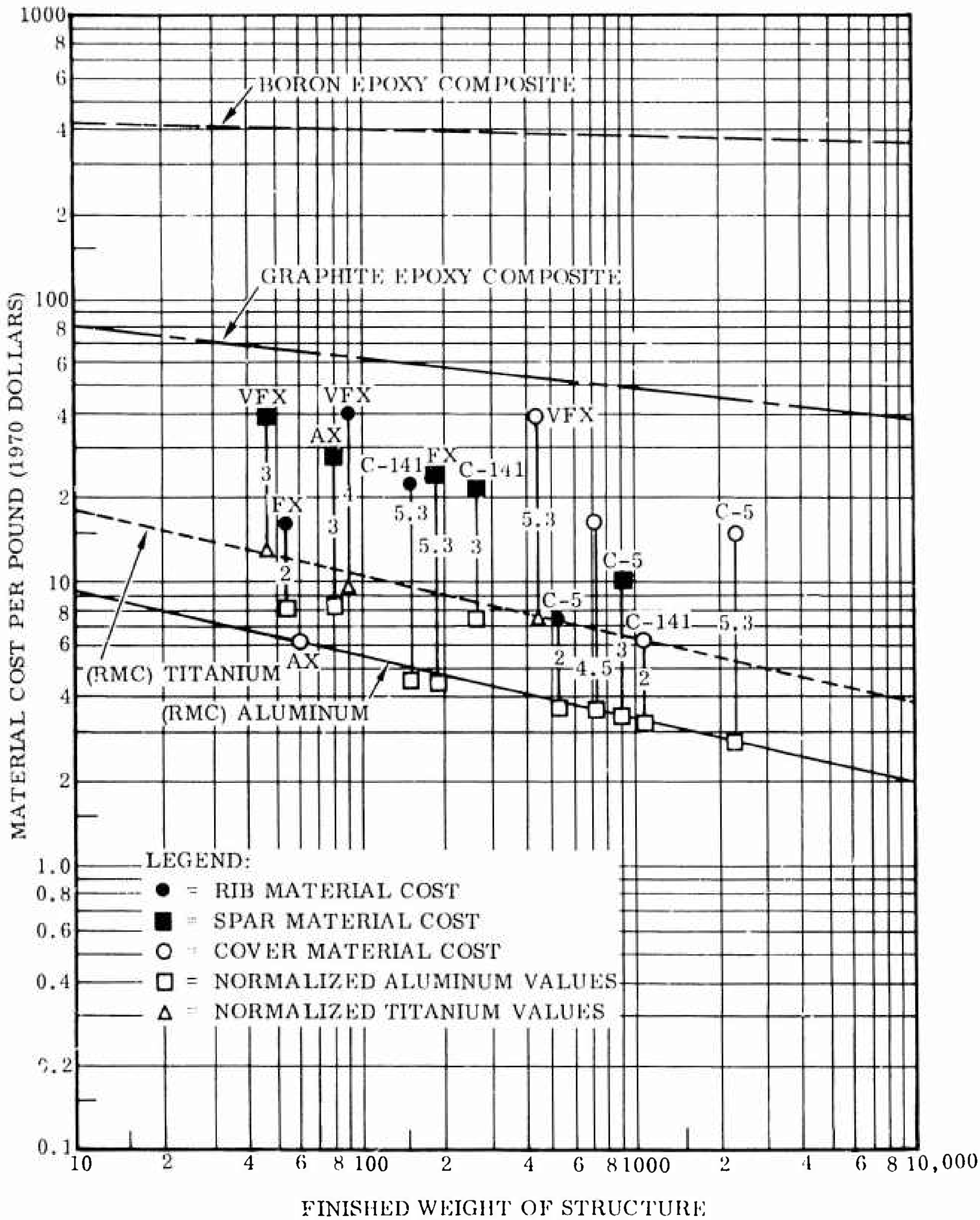


Figure H-2. Rib, Spar, and Cover Cost per Pound Versus Structure Weight.

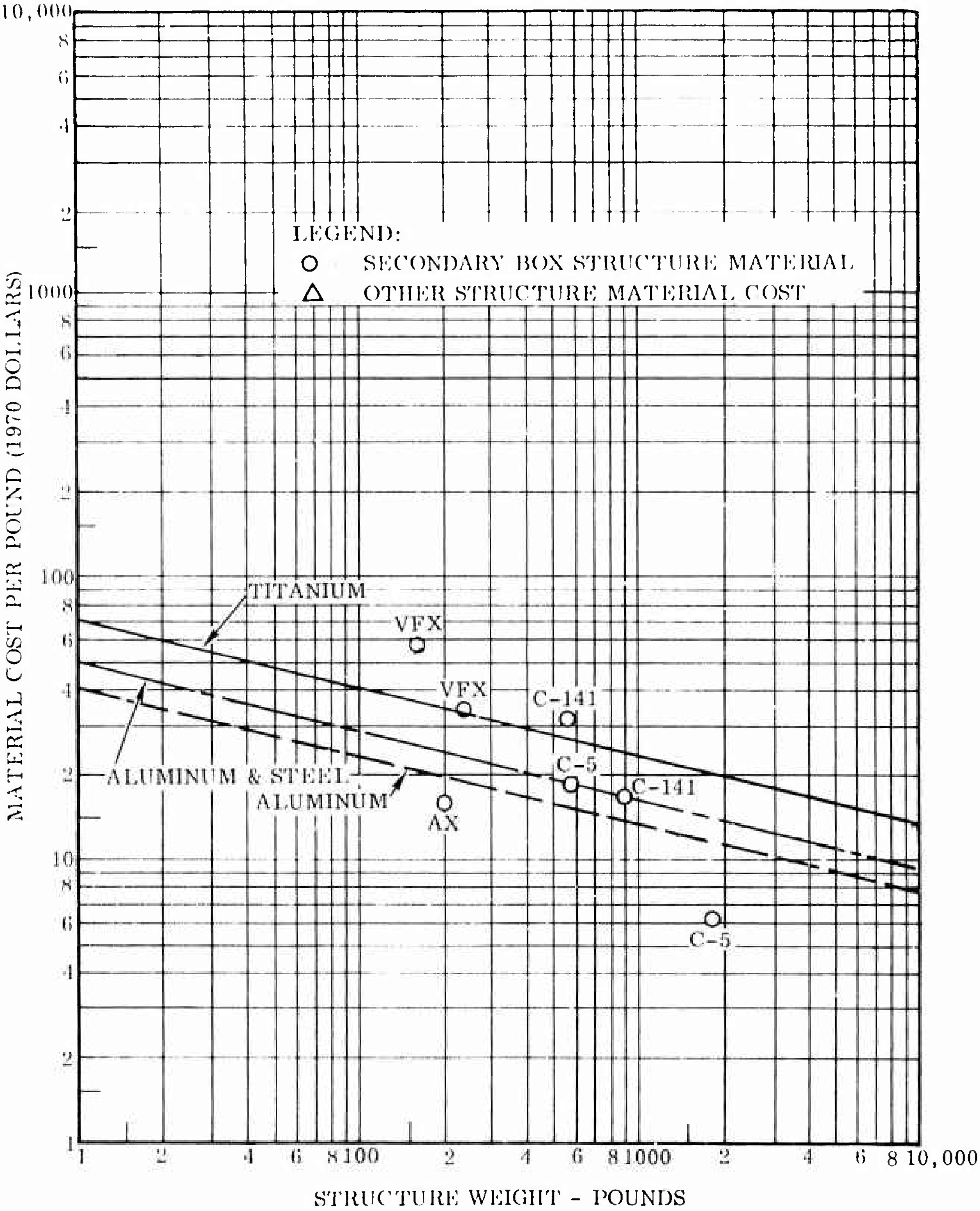


Figure II-3. Secondary Box and Other Structure Cost Versus Structure Weight.

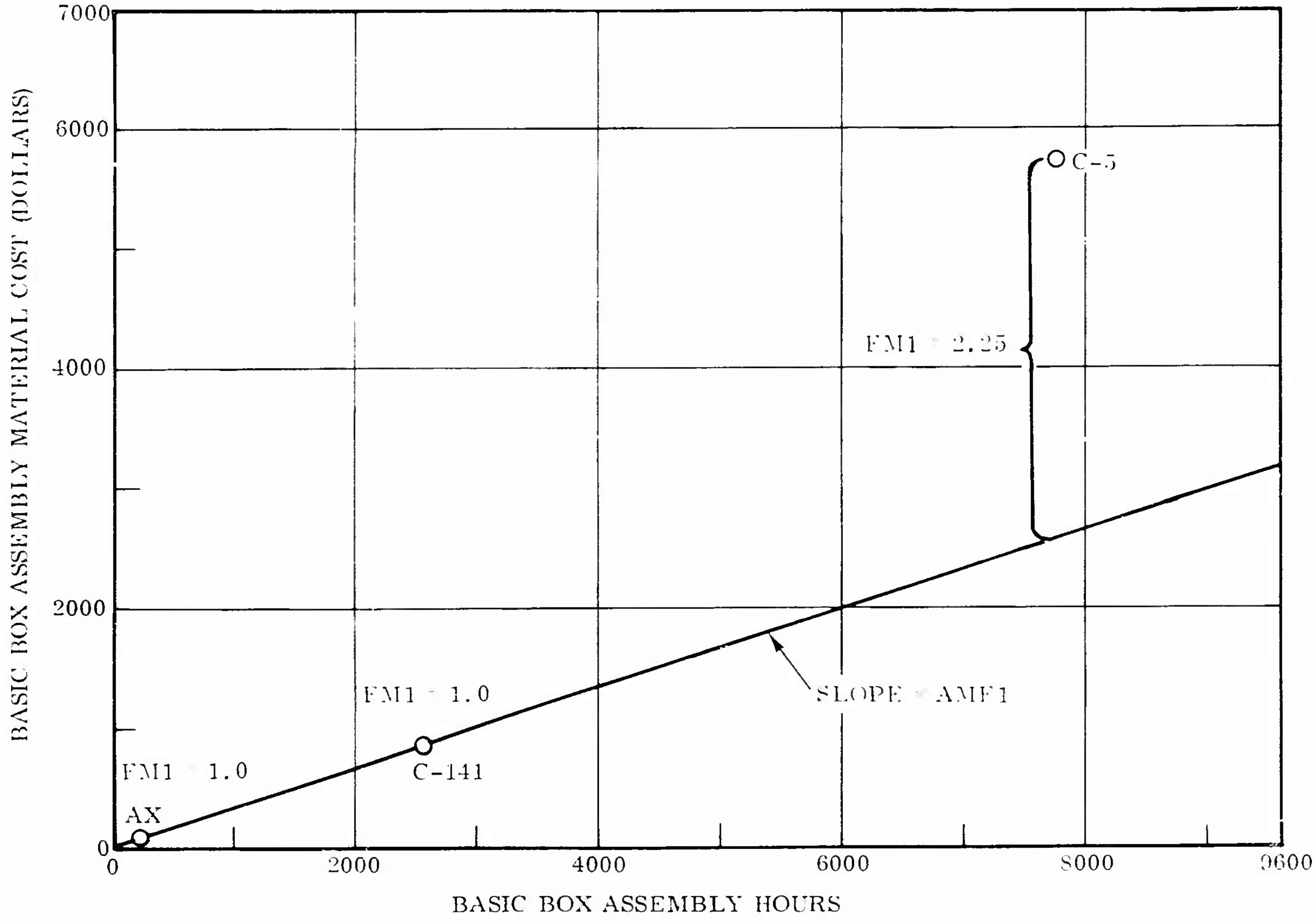


Figure H-4. Basic Box Assembly Material Cost Versus Basic Box Assembly Hours.

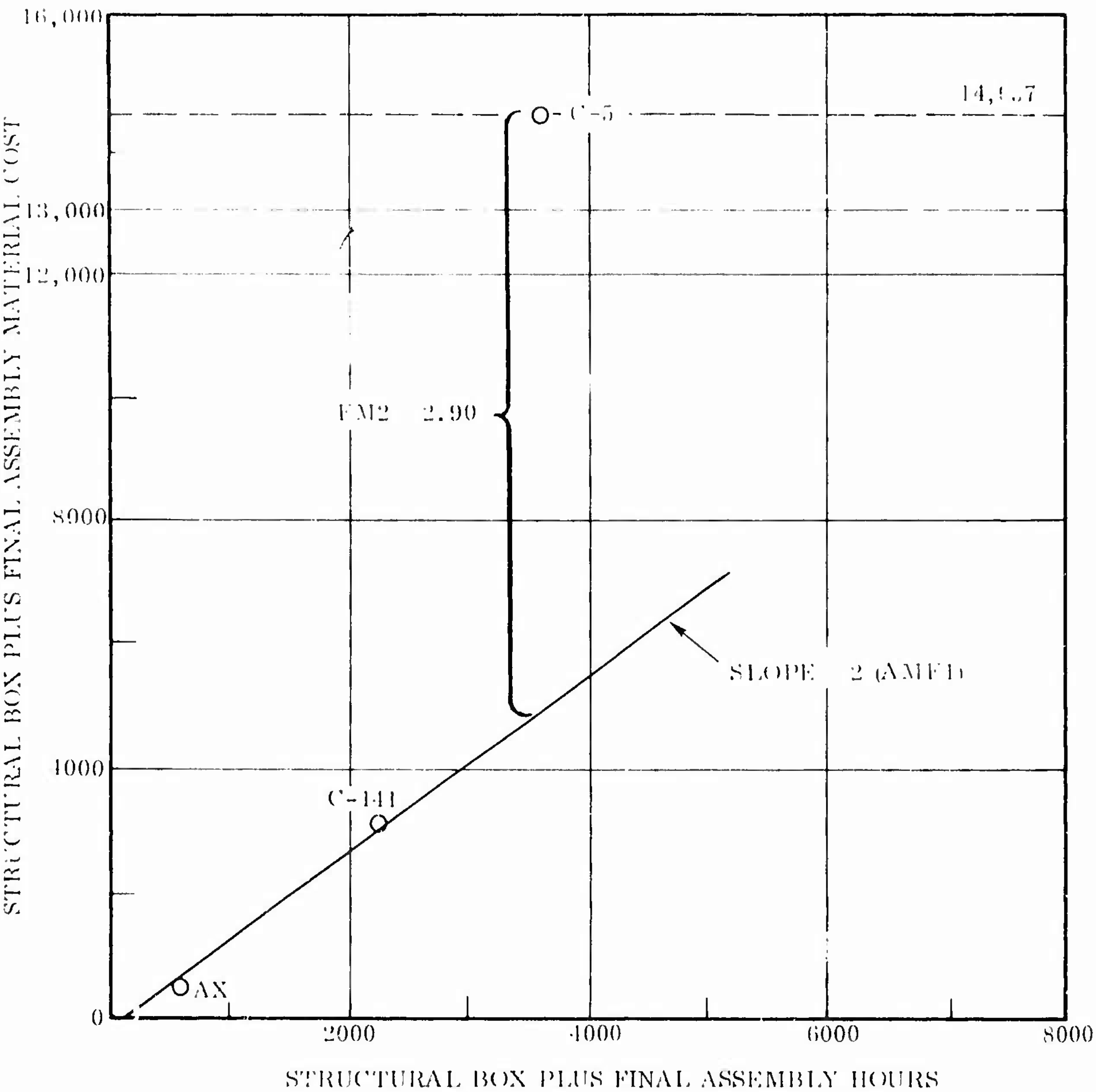


Figure II-5. Material Cost Versus Structural Box Plus Final Assembly Hours.

APPENDIX I

TRADE STUDY NONRECURRING COST ESTIMATING FACTORS

The estimating factors for trade study nonrecurring cost consist of EH and EE from equation (23) for basic structure design engineering hours, F1 from equation (25) for configuration design engineering hours, TMF and ET from equation (28) for basic tool manufacturing hours, and F3 from equation (31) for basic tool engineering hours. Values for EE and EH were summarized in Table 39, and back-up data is provided in Figure I-1 through I-6.

The values used for F1 are discussed under inputs for equation (25). Back-up data appears in Table I-1.

Values for TMF were summarized in Table 40. Back up data for Table 40 is given in Figures I-7 through I-11. These data are used to develop estimating coefficients for a simple, subsonic, design. The complexity factor used as a multiplier in Table 40 is based on previously developed complexity relationships, Table 6, Reference 7. The value of ET, not summarized, is also given by Figures I-7 through I-11.

Values for F3 are obtained from Table I-2. This input is handled as a model card coefficient, although the data in Table I-2 indicates some variation.

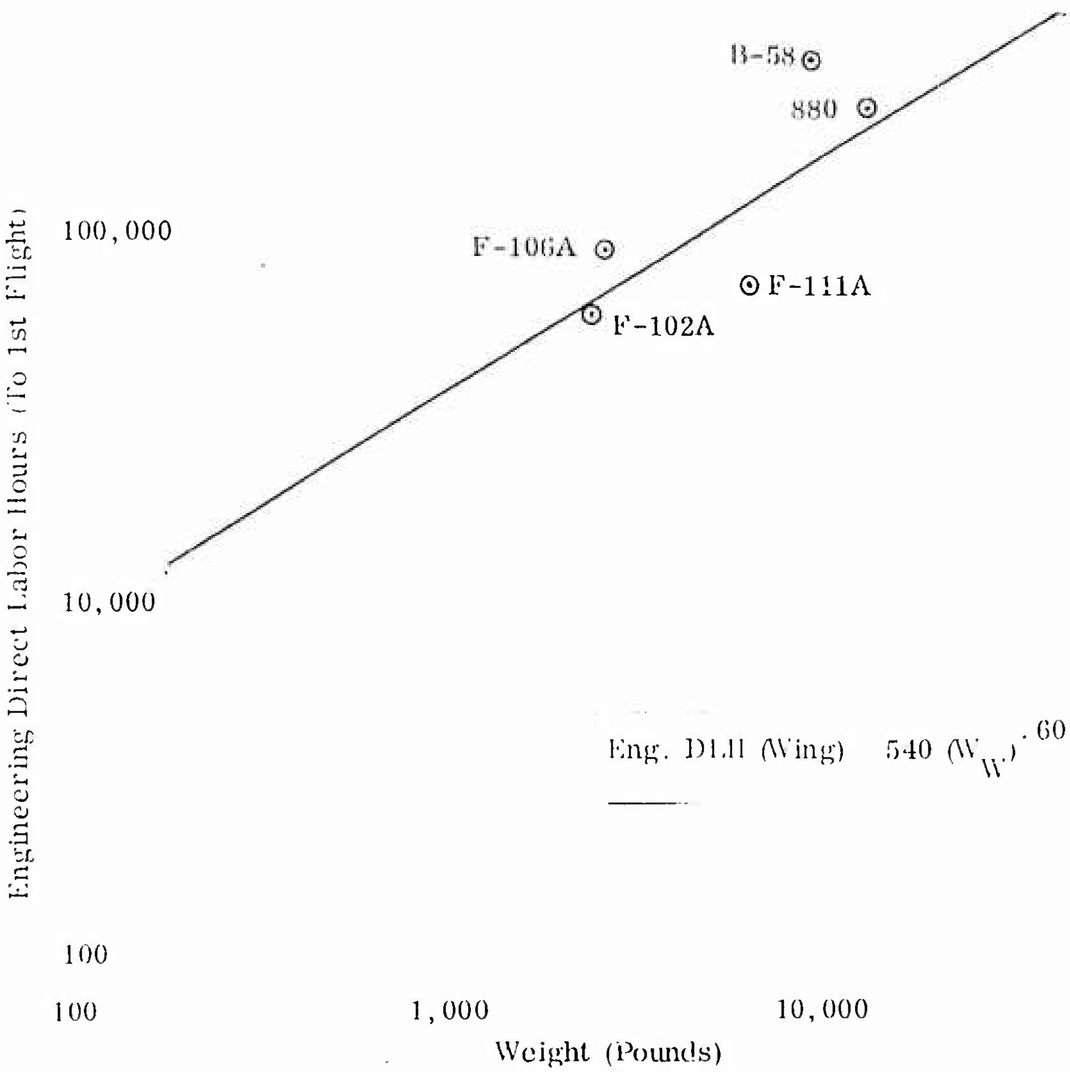


Figure I-1. Wing Engineering Cost Estimating Relationship.

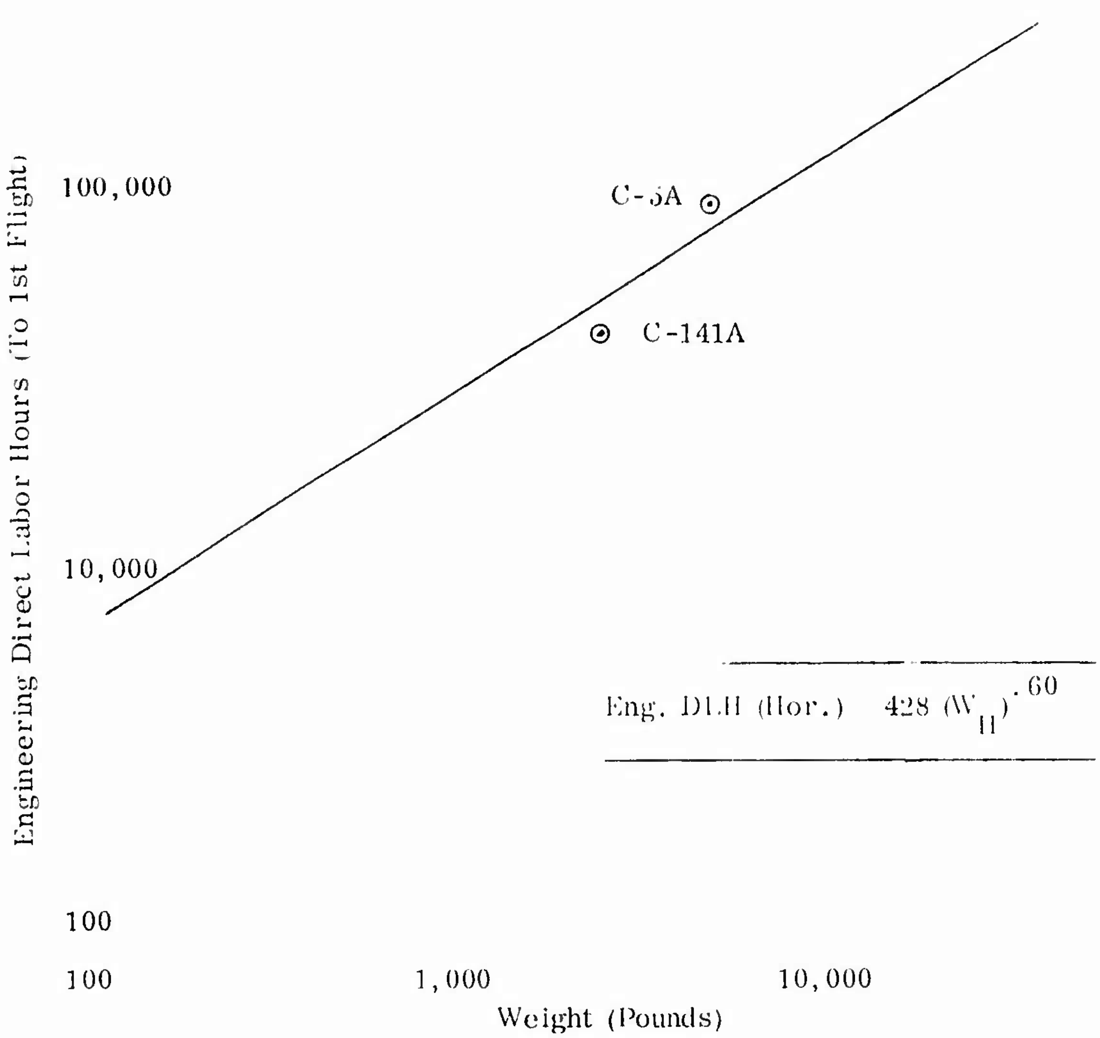


Figure I-2. Horizontal Engineering Cost Estimating Relationship.

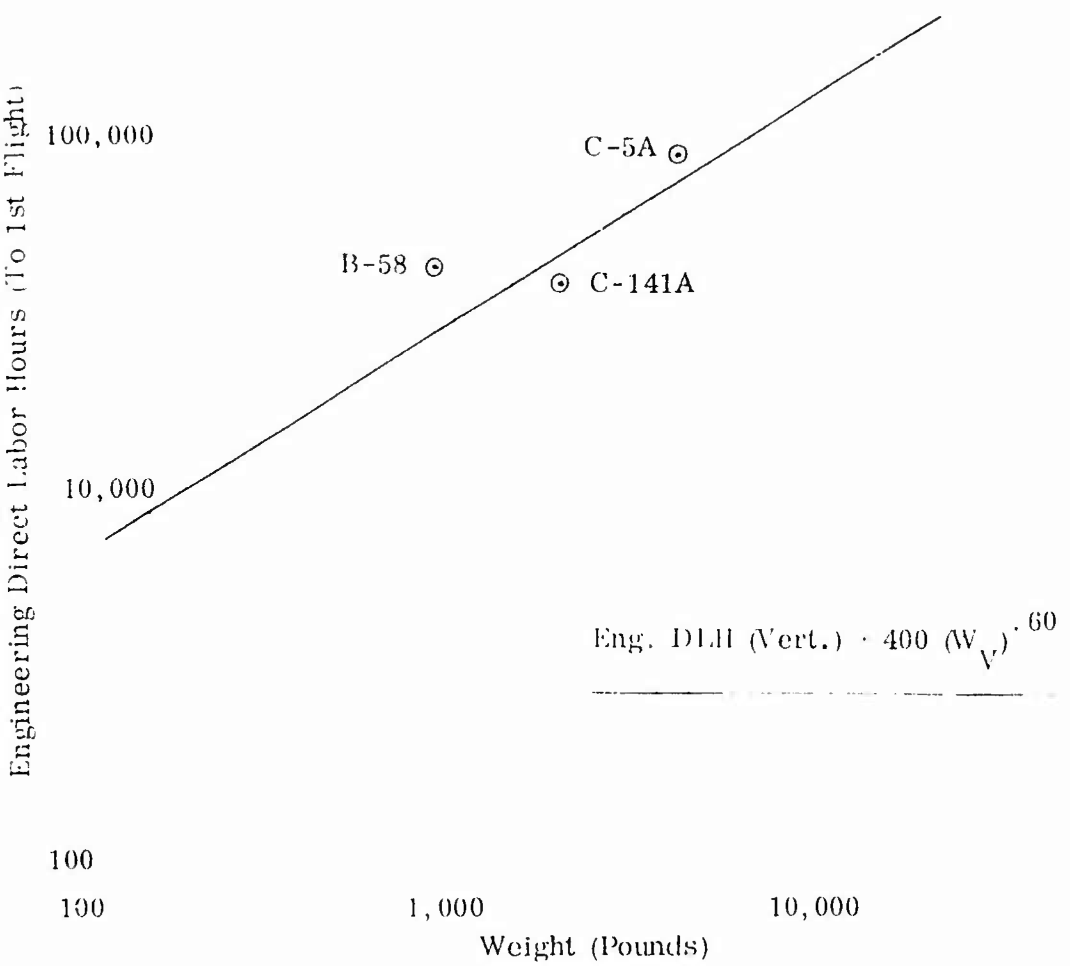


Figure I-3. Vertical Engineering Cost Estimating Relationship.

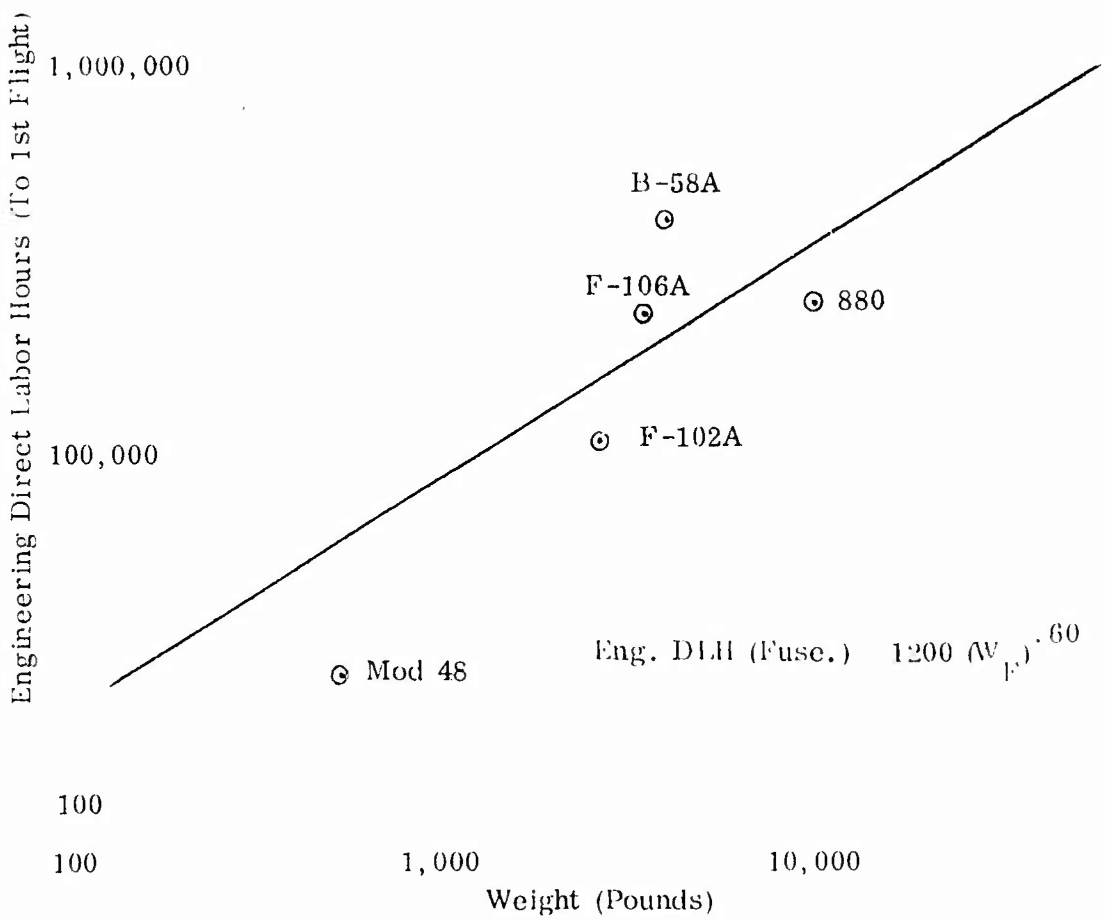


Figure I-4. Fuselage Engineering Cost Estimating Relationship.

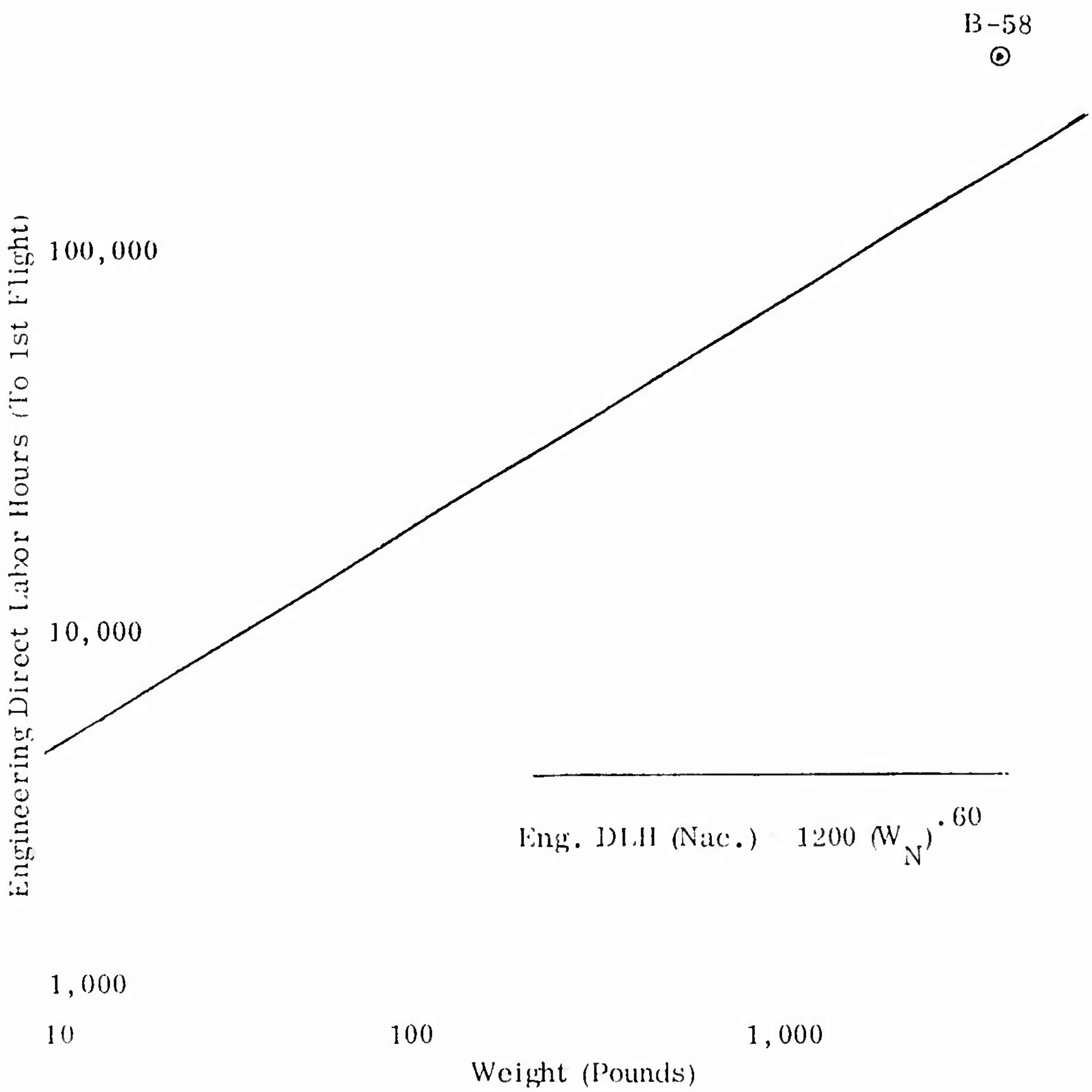


Figure 1-5. Nacelle Engineering Cost Estimating Relationship.

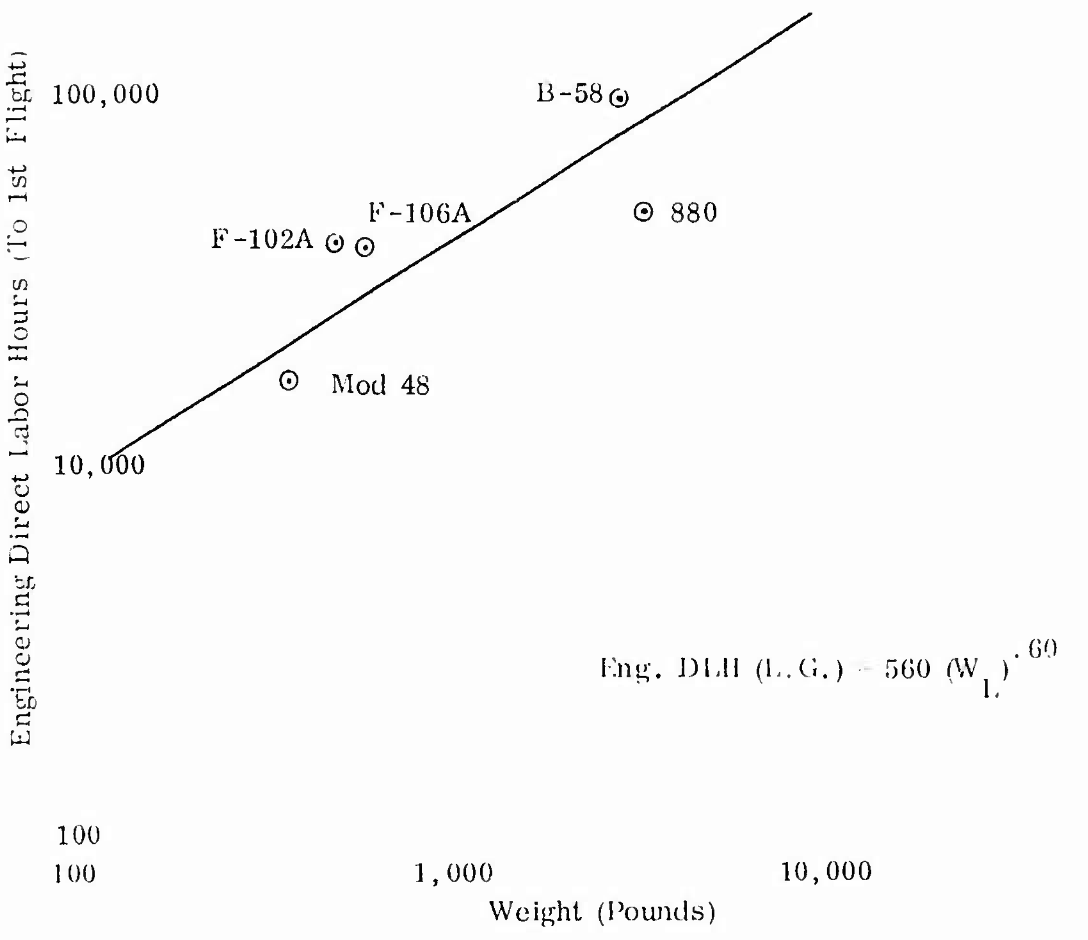


Figure I-6. Landing Gear Engineering Cost Estimating Relationship.

Table I-1. Configuration Design Engineering Hours As A Percentage of Basic Structure Design.

	Type of Support Engineering		
	New Design	Derivative Design	Prototype
Aircraft:			
Model 240	.52		
Model 340		1.10	
Model 880	.86		
Model 110			.47
XB-46			.50
XP54-1			1.24
XF24-1			1.77
XFY-1			1.69
F-102	1.48		
F-106		1.22	
R3Y-1	1.80		
Average	1.16	1.16	1.13
Structural Subsystem:			
C-5 Empennage	.67		
C-141 Empennage	.81		
Transport Fuselage	.53		
Average	.67		

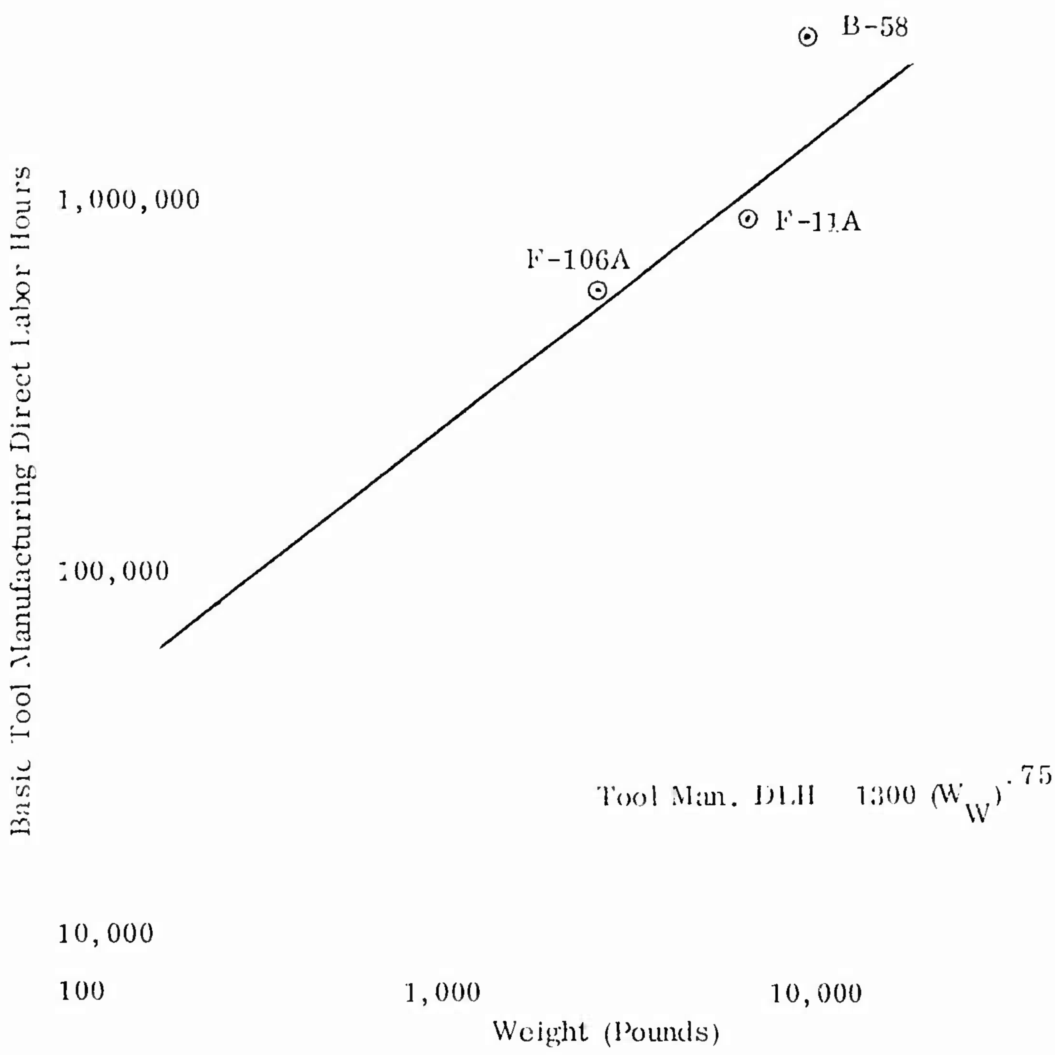


Figure 1-7. Wing Tool Manufacturing Cost Estimating Relationship.

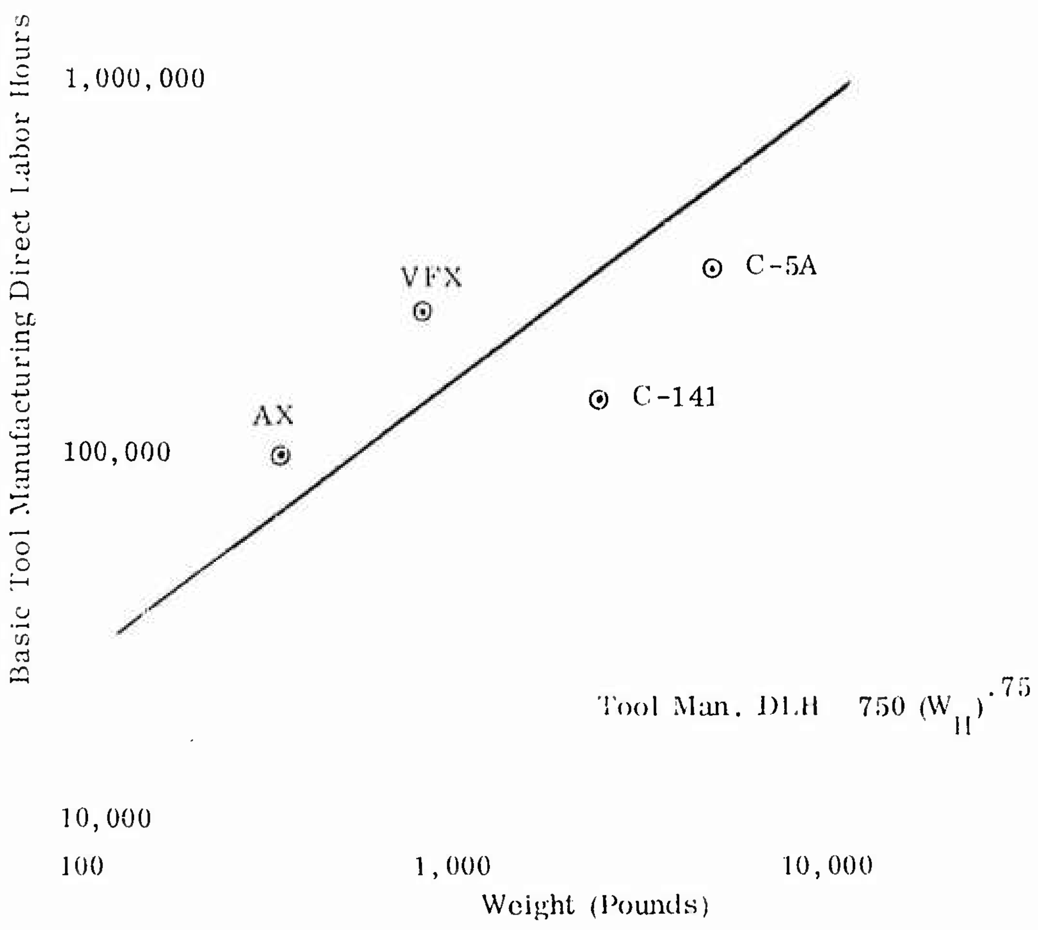


Figure I-8. Horizontal Stabilizer Tool Manufacturing Cost Estimating Relationship.

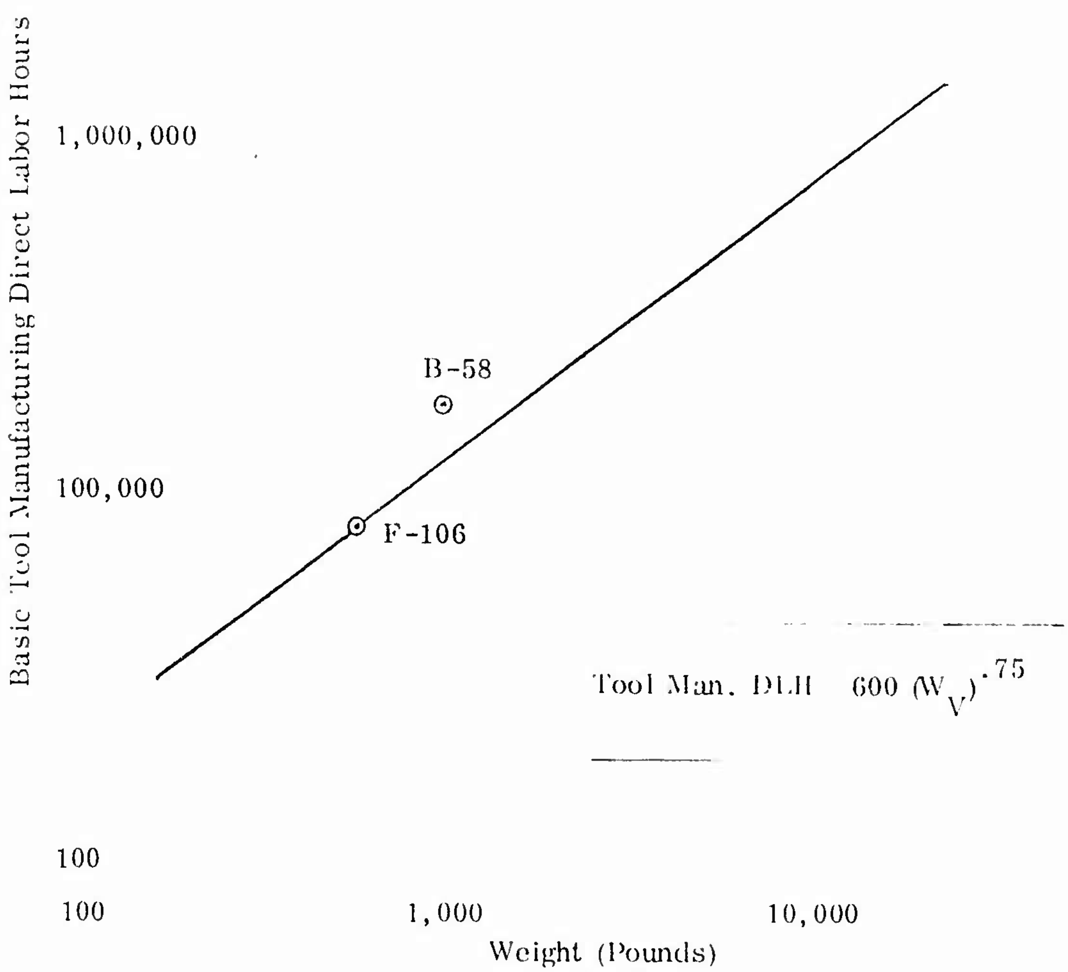


Figure I-9. Vertical Stabilizer Tool Manufacturing Cost Estimating Relationship.

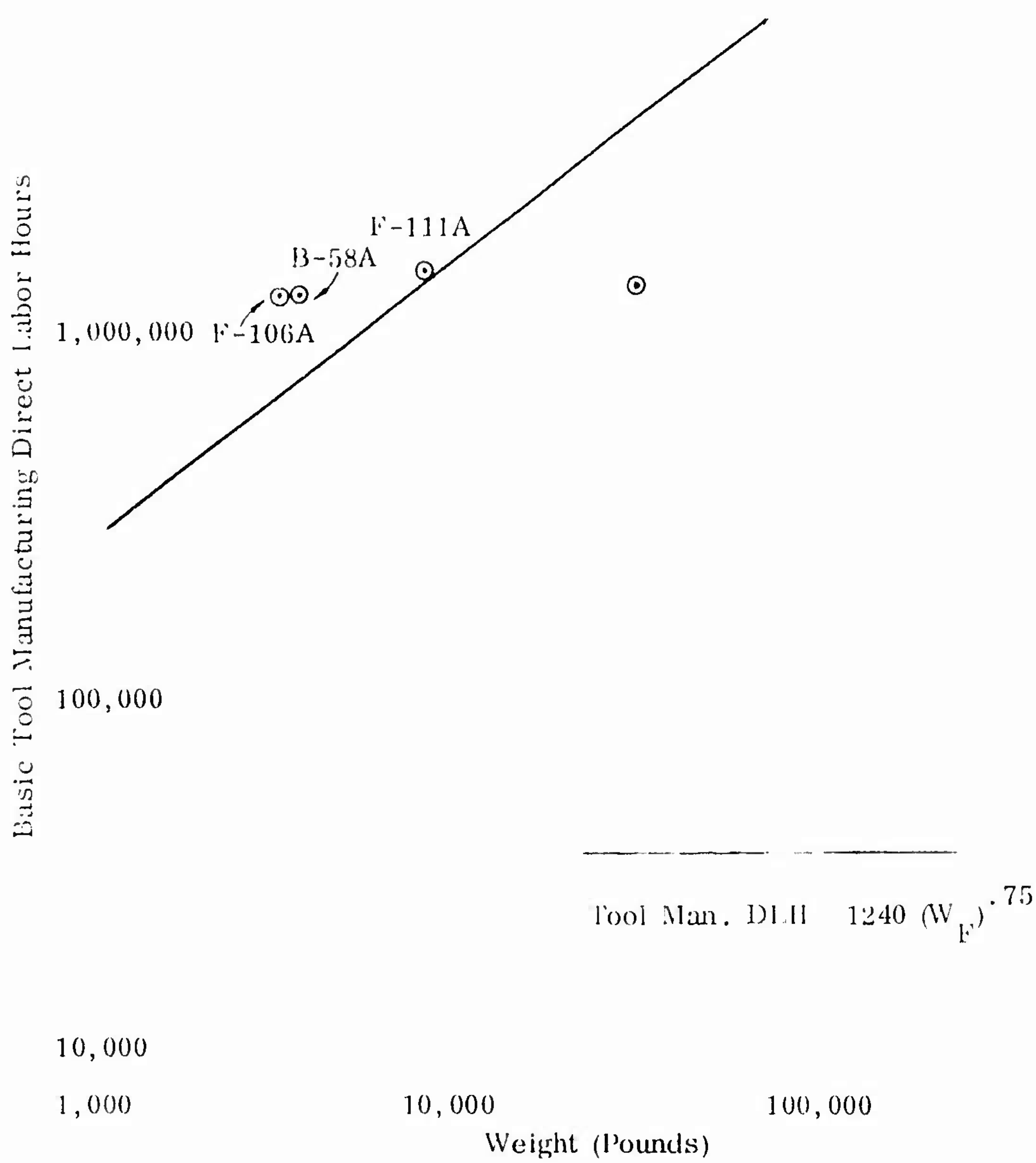


Figure I-10. Fuselage Tool Manufacturing Cost Estimating Relationship.

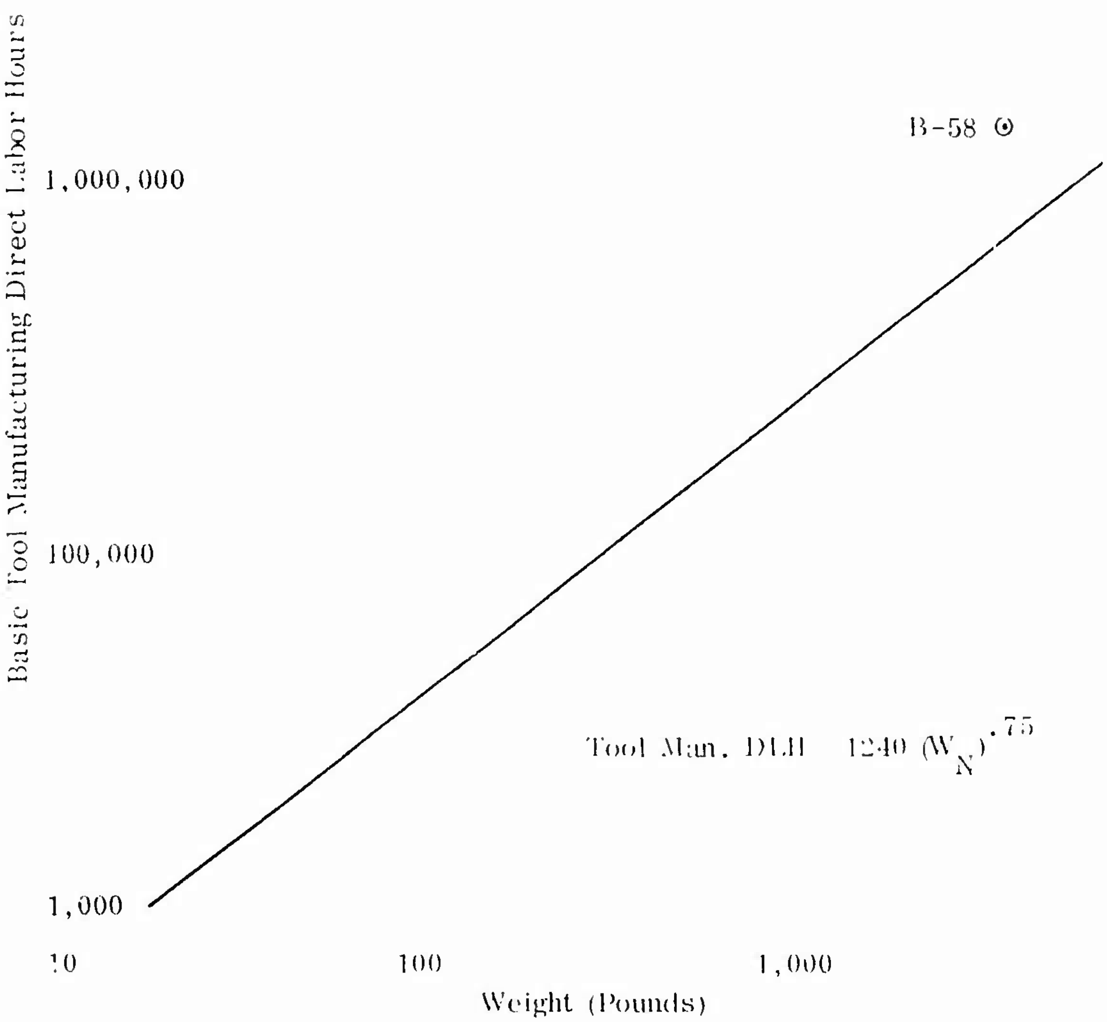


Figure I-11. Nacelle Tool Manufacturing Cost Estimating Relationship.

Table I-2. Ratios of Tool Engineering to Tool Manufacturing Labor: F3.

PROGRAM	AMPR WEIGHT	TOTAL TOOLS	TOOL MFG. HOURS	TOOL ENGRG. PERCENTAGE OF MFG.
A	19,838	25,400	751,734	16.3
B	87,150	66,154	2,986,930	24.9
C	12,074	36,191	2,099,772	23.6
D	6,087	6,315	242,363	32.7
E	11,839	10,439	432,059	33.8
F	42,390	40,506	1,772,730	40.0
G	28,600	48,960	1,958,400	40.0
H	18,263	14,569	559,440	33.0
I	32,548	53,000	3,775,000	45.0
J	25,365	42,200	3,250,000	40.0
K	33,166	24,174	1,314,467	36.0
				(F3)

APPENDIX J

SUPPORTING PROGRAMS DATA TRANSFER WORKSHEETS

The total trade study cost estimating method, including supporting synthesis programs, as depicted in Figure 1 is operated on a modular basis with individual programs in a stand-alone mode. Program integration then is defined as the control, by means of worksheets, of the inputs and outputs between programs. The structure of worksheets to accomplish this varies according to the type of hardware element being estimated. Figure 40 shows the requirement for aerodynamic surfaces, Figure 41 for fuselage, nacelles, and landing gear. Some requirements are repeated, and so on an integrated basis, the following combinations are made:

a. The APAS input cards are the same in both cases, varying only as to values.

b. Dimensional data is covered in a combined worksheet.

The resulting integrated list of worksheets is:

No.	Description	Use
(1)	APAS Inputs	All Components
(2)	Basic Structure Weights	Aero Surfaces
(3)	Inputs to LE-TE Program	Aero Surfaces
(4)	Secondary Structure Weights	Aero Surfaces
(5)	Dimensional Data	All Components
(6)	Inputs to F-N-L Program	F-N-L Components
(7)	F-N-L Weights Data	F-N-L Components

WORKSHEET 1

APAS Program Inputs

This worksheet consists of the input cards required for an APAS run.

This multi-station structural synthesis program performs analysis and redesign operations on one station at a time in a systematic fashion from root to tip. Each loading condition is processed and the full complement of structural elements at that station are satisfactorily optimized before subsequent stations are considered. Input requirements for program execution are identified by the set of input cards described below.

CARD No. 1 OUTPUT CONTROL CARD

Format (413)

KOUT1, KOUT2, KOUT3, KOUT4

Allows user to output various parts of the output to different output devices. A blank card defaults all output to device 6 (printer).

CARD No. 2 ITERATION AND TOLERANCE CONTROL CARD

Format (4 (I5, 5X), 4F10)

IT1, IT2, IT3, IT4, EPS1, EPS2, EPS3, EPS4

Allows user to set limits on accuracy of solution and maximum passes through various iteration loops. A blank card defaults all terms to suggested values.

IT1 Iteration count limit on overall redesign/optimization procedure default value is (5).

IT2 Iteration count limit on fully stressed redesign process.

IT3 Iteration count limit on Fletcher Powell optimization procedure.

IT4 Not used.

EPS1 Tolerance on redesign margins of safety for each redesign cycle (Default value is .001)

EPS2 Tolerance on final margins on safety. At least one non-minimum gage element of each symmetry group for at least one load condition will have a margin of safety which satisfies

$$MS \leq EPS2$$

(Default value is .01).

EPS3 Tolerance on optimization function decrease in Fletcher Powell minimization technique.
(Default value is .001).

EPS4 Tolerance on design variable variation in Fletcher Powell minimization technique
(Default value is .001).

CARD No. 3 TITLE CARD (2 cards)

Format (8A10)

TITLE (I) I = 1, 16

CARD No. 4 CASE CONTROL CARD

Format (10I3)

KEY1, KEY2, KEY3, KEY4, KEY5, KEY6, KEY7, KEY8, KEY9, KEY10

KEY1 Allows user to select one of four geometry input subroutines

KEY1 = 1 specifies a general input subroutine "GINPT1" which is described below.
= 2 not currently available
= 3 not currently available
= 4 not currently available

KEY2 Allows user to select one of four external loads definition subroutines

KEY2 = 1 specifies a load input subroutine "LOADIN" described below by which the user inputs all loads.

KEY2 = 2 not currently available
= 3 not currently available
= 4 not currently available

KEY3 = 0 for fuselage type structures
= 1 for wing like structure

KEY4 Allows user to select how many locations along the structure he wishes to synthesize.

KEY4 = 1 synthesize at every rib/frame
= 2 synthesize at every other rib/frame
= 3 synthesize at every third rib/frame

etc.

KEY5 Not used

KEY6 Allows user to check input

KEY6 0 normal mode
1 check input and quit.

KEY7 Rib/Frame Type Specification

Rib (KEY3 = 1)

KEY7 = 1 corrugated web
= 2 integral web
= 3 built up web
= 4 integral truss
= 5 built up truss

Frame (KEY3 = 0) not currently available

KEY8 Unsupported panel width in terms of percent of panel element width. Used for panel types 10, 11 and 12.

KEY9 Not used

KEY10 Not used

CARD No. 5 MATERIAL SPECIFICATION CARD

Format (I5, 5x, F10.0)

IMAT, FTEN

IMAT = 1 user supplied metallic material
2 AL-2219-T87
3 TI-8AL-1M0-1V
4 AL-2024-T6
5 AL-7075-T6
6 Inconel 718
7 Inconel 625
8 TI-6AL-4V
9 AL-2024-T851
10 Rene' 41

11 User supplied composite material
12 NARMCO 5505 Boron-Epoxy
13 NARMCO 5206 Graphite-Epoxy

FTEN — Factor applied to ultimate tension allowable to account for fatigue fracture mechanics, etc.

FT = FTEN * FTU

<u>CARD No. 5A</u> USER SUPPLIED METALLIC MATERIAL PROPERTIES. (USED WHEN IMAT = 1)

This option allows the user to input a material not found in the material table above. The properties may be input as a function of temperature at nine specified temperatures.

5A1 Material title card
Format (8A10)

5A2 NTEMP
Format (I10)
NTEMP is the number temperature points specified.

5A3 Room temperature properties cards (2 cards)
Format (3F10.0, 2F20.0/F20.0,3F10.0)
FTU FCY FSU EC E G RHO F07 EN

5A4 Temperature factors cards. (9 cards maximum)
Format 10F8.0)

TEMP, FFTU, FFCN, FFSU, FEC, FE, FG, FRHO, FF07, FEN

<u>CARD No. 5B</u> USER SUPPLIED COMPOSITE MATERIAL PROPERTIES (Used when IMAT= 11)

This option allows the user to input a composite material not found in the material table.

5B1 Material title card
Format (8A10)

5B2 Room temperature properties cards (2 cards)
Format (3F20.0, F10.0/6F10.0)

E11, E22, G12, U12, DEN, EPSAL1,2,3,4,5,

<u>CARD No. 6</u> GEOMETRY CONTROL CARD
Format (4I3)

NODES, NWEB, NLONG, NSTAG

NODES Number of node points in a cross-section (must be at least 2 and may be maximum of 20)

NWEB Number of interior webs (Max. of 3)

NLONG Number of spar caps/longerons (Max. of 10) (must be located at nodal points)

NSTAG Number of geometry control stations (Max. of 20)

CARD No. 7 GEOMETRY CONTROL STATION HEADER CARD

Format (6F10.0)

STAG, FRSP, XLDRF, ZLDRF, GTRX, GTRZ

STAG Station number of control station

FRSP Rib/Frame Spacing

XLDRF Coordinates of input loads

ZLDRF Reference Point

GTRX Taper ratio of structure

GTRZ In the X and Z directions

CARD No. 8 GEOMETRY NODAL COORDINATE DECK

Format (I5, 5X, 2F10.0) (1 card for each node)

NODE, X, Z

NODE Node number start with 1 and number consecutively around the structure clockwise.

X
Z Coordinates of node point

Repeat Cards 7 and 8 for each geometry control station.

CARD No. 9 INTERNAL WEB LOCATION CARD

Format (6I3) (Omit if NWEB is 0)

IW1, LW1, IW2, LW2, IW3, LW3.

IW1 Node number of first node to which an interior web is attached (Web No. 1)

LW1 Node number at other end of web No. 1

IW2
LW2 Same as above for next interior web.

IW3
LW3 Same as above for last interior web.

CARD No. 10 SPARCAP/LONGERON NODE IDENTIFICATION DECK

Format (4 (I3, 2X, F10.0, 5X))

L1, DL1, L2, DL2, etc., four sets per card - one set for each longeron

Li Node number of spar cap/longeron i

DLi Orientation angle of spar cap/longeron

CARD No. 11 SYMMETRY GROUP CONTROL CARD

Format (3I3)

NSGP, NSGW, NSGL

NSGP Number of panel symmetry groups

NSGW Number of interior web symmetry groups

NSGL Number of sparcaps (Longeron) symmetry groups.

CARD No. 12 PANEL SYMMETRY GROUP IDENTIFICATION DECK (1 card per symmetry group)

Format (24I3)

NMAX, NS(I) I=1, NMAX

NMAX Number of panels in this symmetry group

NS(1) Panel number of first panel in the symmetry group going CW around the cross section.

NS(2) Panel number of next panel

Etc.

CARD No. 13 INTERIOR WEB SYMMETRY GROUP IDENTIFICATION DECK (1 card per symmetry group)

Follow the same procedure as for panel symmetry group deck.

CARD No. 14 LONGERON (SPARCAP) SYMMETRY GROUP IDENTIFICATION DECK.

Follow same procedure as for panel symmetry group deck.

CARD No. 15 STRUCTURAL ELEMENT CONFIGURATION SPECIFICATION DECK

This deck defines the structural configuration desired for each panel, web, or longeron (spar cap). A deck is required for each symmetry group defined, an additional deck is required for each panel, web or longeron (spar cap) which does not belong to a symmetry group. The order of the decks is as follows:

PANELS

(a) Symmetry group 1 thru NMAX
(b) Panels which are not members of symmetry groups, starting with the lowest such panel number and going CW around the structure.

WEBS

Follow same procedure as for panels.

LONGERONS (Spar-Caps)

Follow same procedure as for panels.

CARD No. 15A TYPE IDENTIFICATION CARD

Format (2I3)

ITYP, IDSET

ITYP Structural configuration type number

IDSET (Optional) Each deck may be given an ID number which can be referred on other type identification cards which have identical structural element configuration specification decks. When referring to an ID number specified on a previous deck, cards 15b through 15f are omitted. (Note: Web Id's may not refer to panel ID's, etc.)

CARD No. 15b T SPECIFICATION CARD

Format (4F10.0)

T1, T2, T3, T4

Initial values for T variables.

CARD 15c TMIN SPECIFICATION CARD

Format (4F10.0)

TMIN1, TMIN2, TMIN3, TMIN4

Minimum values for T variables on card 15b. This card allows the user to specify minimum gages for the T variables. He may also fix a T variable at its initial value by setting its TMIN to 0. (Note: At least one T variable must have a non-zero TMIN.)

CARD 15d B VARIABLE SPECIFICATION CARD

Format (4F10.0)

B1, B2, B3, B4

Initial values for B variables

CARD 15c BMIN SPECIFICATION CARD

Format (4F10.0)

BMIN1, BMIN2, BMIN3, BMIN4

Minimum values for B variables. The user may fix any or all B values to their initial values by setting their respective BMIN values to zero.

CARD 15f BMAX SPECIFICATION CARD

Format (4F10.0)

BMAX1, BMAX2, BMAX3, BMAX4

Maximum limits for B variables. These values are ignored if corresponding B MIN values are zero.

CARD No. 16 INPUT LOADS CONTROL CARD

Format (I5, 5X, F10.0)

NCOND, FULT

NCOND Number of loading conditions (Maximum of 6).

FULT Ultimate factor of safety.

CARD No. 17 LOAD CONDITION HEADER CARD

Format (4A10, I5, 5X, F10.0)

Condition title, NSTAY, press condition title 40 characters

NSTAY Number of stations at which the load case is defined

PRESS Internal pressure used for fuselage structures.

CARD 17a LOAD COMPONENT FACTOR CARD

Format (8F10.0/F10.0) (2 cards)

(These factors applied to cards 17b)

FLIN	Factor applied to input stations to produce station numbers. (e.g., input stations could be entered in percent fuselage length (wing span) and then FLIN would be actual fuselage length (wing span).
FLD	Factor applied to all input load components
FA	Factor applied to AXIAL loads
FXS	Factor applied to XSHEAR loads
FZS	Factor applied to ZSHEAR loads
FTOR	Factor applied to TORSION loads
FXM	Factor applied to XMOMENTS
FZM	Factor applied to ZMOMENTS
FTEMP	Factor applied to TEMPERATURE

Note: Factored load components are used by the program as limit design loads.

If cards 17a are blank, all factors are defaulted to 1.

CARD 17b LOAD POINT CARD

Format (8F10.0)

STA, AX, SX, ZS, TOR, XMOM, ZMOM, TEMP

STA	Station Number
AX	Station axial load
XS	Station X Shear force
ZS	Z SHEAR
TOR	Torque
XMOM	Bending moment about X axis
ZMOM	Bending moment about Z axis
TEMP	Structural temperature degrees Farenheit

WORKSHEET 2

Basic Structure Weights

Basic structure weights are produced in the form shown in Table J-1. The data are taken directly from the APAS program output printout, which is in the following form:

Theoretical Weight:

Skin Panel	336.106
Ribs	30.211
Spars	143.157
Total	509.474

These values are multiplied by 2 (except in the case of the vertical stabilizer), to account for left and right elements, and are entered as synthesis weight in Table J-1. Correlation factors are developed by dividing actual weight by synthesis weight. These factors are accrued in a library of data that becomes the source of analogs for future estimating of "actual" weight from synthesis weight.

Table J-1. Aerodynamic Surfaces Basic Structure Weights.

A-X Wing

Part Definition	Actual Weight	Synthesis Weight	Correlation Factors
Inter-spar cover	750	672	1.12
Spars	410	286	1.43
Ribs	316	60	5.27

WORKSHEET 3

Inputs to Leading Edge-Trailing Edge Synthesis Program

A namelist type input is used with the variable name, value, and definition of the variable name on one card. A complete list of input variables for the tip is presented in Table J-2. The input variables required for the remaining structural types are presented in sample case listings in Tables J-3 through J-11. Inputs given in Table J-2 are applicable unless modified by the input value in any subsequent table.

Table J-2. List of Input.

```
P$INPNL
C
C                       F-111 WING TIP
C
 CLESI = 0.0      ,DEF=55H SLAT INBD.EDGE LOCATION (FACTOR OF SEMI-SPAN)          ,
 CLESO = 0.0      ,DEF=55H SLAT OUTBD.EDGE LOCATION(FACTOR OF SEMI-SPAN)          ,
 CLMAX = 0.0      ,DEF=55H MAXIMUM WING LIFT COEFFICIENT                          ,
 CSCDWC= 0.0      ,DEF=55H SURFACE CHORD TO WING CHORD RATIO                      ,
 CWSPIN= 0.0      ,DEF=55H RATIO OF INBOARD END OF SPOILER TO WING SEMI-SPAN      ,
 CWSPOT= 0.0      ,DEF=55H RATIO OF OUTBOARD END OF SPOILER TO WING SEMI-SPAN     ,
 D     = 0.0      ,DEF=55H SLAT EDGE AND LEADING EDGE STATIONS (FT)               ,
 DBW   = 0.0      ,DEF=55H BODY WIDTH (FT)                                        ,
 DCSL  = 0.0      ,DEF=55H SURFACE LENGTH (IN)                                    ,
 DCSWI = 0.0      ,DEF=55H SURFACE CHORD AT INBOARD END (IN)                      ,
 DCSWO = 0.0      ,DEF=55H SURFACE CHORD AT OUTBOARD END(IN)                      ,
 DCSYI = 0.0      ,DEF=55H SURFACE INBOARD EDGE LOCATION (DECIMAL OF SEMI-SPAN)   ,
 DCYSI = 0.0      ,DEF=55H LEADING EDGE INBOARD STATION (FT)                      ,
 DCYSO = 0.0      ,DEF=55H LEADING EDGE OUTBOARD STATION (FT)                     ,
 DFELC = 0.0      ,DEF=55H LENGTH OF LEADING EDGE OUTBOARD OF CENTER SLAT (FT)    ,
 DFELI = 0.0      ,DEF=55H LENGTH OF LEADING EDGE INBOARD OF CENTER SLAT (FT)     ,
 DFELO = 0.0      ,DEF=55H LENGTH OF FIXED LEADING EDGE OUTBOARD OF SLAT (FT)     ,
 DFEWCI= 0.0      ,DEF=55H INBOARD LEADING EDGE CHORD OUTBOARD OF CENTER SLAT-FT  ,
 DFEWCO= 0.0      ,DEF=55H OUTBOARD LEADING EDGE CHORD OUTBOARD OF CENTER SLAT-FT,
 DFEWII= 0.0      ,DEF=55H INBOARD LEADING EDGE CHORD INBOARD OF CENTER SLAT-FT   ,
 DFEWIO= 0.0      ,DEF=55H OUTBOARD LEADING EDGE CHORD INBOARD OF CENTER SLAT-FT  ,
 DFEWOI= 0.0      ,DEF=55H INBOARD LEADING EDGE CHORD OUTBOARD OF SLAT (FT)       ,
 DFEWOO= 0.0      ,DEF=55H OUTBOARD LEADING EDGE CHORD OUTBOARD OF SLAT (FT)      ,
 DFXLE = 0.0      ,DEF=55H FIXED LEADING EDGE LENGTH                              ,
 DFXWI = 0.0      ,DEF=55H FIXED LEADING EDGE WIDTH INBD                          ,
 DFXWO = 0.0      ,DEF=55H FIXED LEADING EDGE WIDTH OUTBD                         ,
 DHB   = 0.0      ,DEF=55H HORIZONTAL TAIL SPAN                                   ,
 DHCR  = 0.0      ,DEF=55H HORIZONTAL TAIL ROOT CHORD                             ,
 DHCT  = 0.0      ,DEF=55H HORIZONTAL TAIL CHORD AT TIP (FT)                      ,
 DHTT  = 0.0      ,DEF=55H HORIZONTAL TAIL THICKNESS AT TIP (FT)                  ,
 DISWI = 0.0      ,DEF=55H INBOARD SLAT INBOARD CHORD (FEET)                      ,
 DISWO = 0.0      ,DEF=55H INBOARD SLAT OUTBOARD CHORD (FEET)                     ,
 DLELC = 0.0      ,DEF=55H LENGTH OF LEADING EDGE UNDER CENTER SLAT (FT)          ,
 DLELI = 0.0      ,DEF=55H LENGTH OF LEADING EDGE UNDER INBOARD SLAT (FT)         ,
 DLELO = 0.0      ,DEF=55H LENGTH OF LEADING EDGE UNDER OUTBOARD SLAT (FT)        ,
 DLESLC= 0.0      ,DEF=55H CENTER SLAT LENGTH (FEET)                              ,
 DLESLI= 0.0      ,DEF=55H INBOARD SLAT LENGTH (FEET)                             ,
 DLESLO= 0.0      ,DEF=55H OUTBOARD SLAT LENGTH(FEET)                             ,
 DLEWCI= 0.0      ,DEF=55H INBOARD LEADING EDGE CHORD UNDER CENTER SLAT (FT)      ,
 DLEWCO= 0.0      ,DEF=55H OUTBOARD LEADING EDGE CHORD UNDER CENTER SLAT (FT)     ,
 DLEWII= 0.0      ,DEF=55H LEADING EDGE INBOARD CHORD UNDER INBOARD SLAT (FT)     ,
 DLEWIO= 0.0      ,DEF=55H LEADING EDGE OUTBOARD CHORD UNDER INBOARD SLAT (FT)    ,
 DLEWOI= 0.0      ,DEF=55H INBOARD LEADING EDGE CHORD UNDER OUTBOARD SLAT (FT)    ,
 DLEWOO= 0.0      ,DEF=55H OUTBOARD LEADING EDGE CHORD UNDER OUTBOARD SLAT (FT)   ,
 DOSWI = 0.0      ,DEF=55H OUTBOARD SLAT INBOARD CHORD (FEET)                     ,
 DOSWO = 0.0      ,DEF=55H OUTBOARD SLAT OUTBOARD CHORD(FEET)                     ,
 DVB   = 0.0      ,DEF=55H VERTICAL TAIL SPAN                                     ,
 DVCR  = 0.0      ,DEF=55H VERTICAL TAIL ROOT CHORD                               ,
 DVCT  = 0.0      ,DEF=55H VERTICAL CHORD AT TIP (FT)                             ,
 DVTT  = 0.0      ,DEF=55H VERTICAL THICKNESS AT TIP (FT)                         ,
 DWB   = 0.0      ,DEF=55H WING,HORIZ STAB,OR VERT STAB SPAN (FEET)               ,
 DWCLE = 0.0      ,DEF=55H WING CHORD AT SLAT (FT) ACTUALLY AT MIDSPAN OF EXPOSED,
 DWCR  = 0.0      ,DEF=55H WING CHORD AT THE ROOT (FT)                            ,
 DWCT  =4.1       ,DEF=55H WING CHORD AT TIP (FT)                                 ,
 DWTT  =0.416     ,DEF=55H WING THICKNESS AT THE TIP (FT)                         ,
 DWYENG= 0.0      ,DEF=55H ENGINE STATION (FT) TWO-ENGINE AIRPLANE                ,
```

Table J-2. List of Input (Continued).

```
 DWYIEN= 0.0       ,DEF=55H INBOARD ENGINE STATION (FT) FOUR-ENGINE AIRPLANE     ,
 DWYOEN= 0.0       ,DEF=55H OUTBOARD ENGINE STATION (FT)FOUR-ENGINE AIRPLANE     ,
 GHFS   = 0.0      ,DEF=55H LOCATION OF HORIZONTAL FRONT SPAR (PERCENT ROOT CHORD),
 GHRS   = 0.0      ,DEF=55H LOCATION OF HORIZONTAL REAR SPAR (PERCENT ROOT CHORD) ,
 GVFS   = 0.0      ,DEF=55H LOCATION OF VERTICAL FRONT SPAR (PERCENT ROOT CHORD) ,
 GVRS   = 0.0      ,DEF=55H LOCATION OF VERTICAL REAR SPAR (PERCENT ROOT CHORD)  ,
 GWAIL  = 0.0      ,DEF=55H RATIO OF INBOARD AILERON STATION TO WING SEMI-SPAN   ,
 GWCFFL= 0.0       ,DEF=55H RATIO OF FOREFLAP CHORD TO FLAP CHORD                ,
 GWCFLP= 0.0       ,DEF=55H FLAP CHORD TO WING CHORD RATIO                       ,
 GWCLE  = 0.0      ,DEF=55H RATIO OF SLAT CHORD TO WING CHORD                    ,
 GWFS   =0.24349   ,DEF=55H WING WING FRONT SPAR LOCATION (FACTOR OF WING CHORD) ,
 GWRS   =0.69166   ,DEF=55H LOCATION OF WING REAR SPAR (PERCENT ROOT CHORD)      ,
 GWTCR  = 0.0      ,DEF=55H WING T/C AT ROOT                                     ,
 GWTCT  = 0.0      ,DEF=55H WING T/C AT TIP                                      ,
 NZ     = 0.0      ,DEF=55H DESIGN LOAD FACTOR                                   ,
 QENG   = 0.0      ,DEF=55H NUMBER OF ENGINES                                    ,
 QMAX   = 0.0      ,DEF=55H MAXIMUM DYNAMIC PRESSURE (PSI)                       ,
 SIGCR  = 0.0      ,DEF=55H DENSITY FACTOR AT ALTITUDE                           ,
 SW     = 0.0      ,DEF=55H WING,HORIZ. STAB.,OR VERT.STAB AREA (SQ.FT.)         ,
 SWAIL  = 0.0      ,DEF=55H                                                      ,
 SWFLAP= 0.0       ,DEF=55H WING FLAP AREA (SQ.FT.)                              ,
 TIPWI  =18.0      ,DEF=55H INPUT TIP WIDTH                                      ,
 TST1   = 0.0      ,DEF=55H DESIGN GROSS WEIGHT (LBS.)                           ,
 VS     = 0.0      ,DEF=55H STALL SPEED (KNOTS)                                  ,
 ZOLDGM= 0.0       ,DEF=55H FLAG FOR GEOM ROUTINES                               ,
 L      = 0.0      ,DEF=55H SURFACE NUMBER                                       ,
C                           FOREFLAP= 1 THRU 20
C                           FLAP     =21 THRU 25
C                           AILERON =26 THRU 30
C                           SLAT     =41 THRU 46
C                           RUDDER   =47 THRU 51
C                           ELEVATOR=52 THRU 56
 LSURF =          7,DEF=55H SURFACE CODE                                         ,
C                                1=AILERON                                       ,
C                                2=RUDDER                                        ,
C                                3=ELEVATOR                                      ,
C                                4=FLAP                                          ,
C                                5=SLAT                                          ,
C                                6=FOREFLAP                                      ,
C                                7-TIP                                           ,
C                                8-FIXED LEADING EDGE                            ,
C                                9-SPOILERS                                      ,
C                               10-FIXED TRAILING EDGE                           ,
 LL(1) = 0.0       ,DEF=55H NO SLATS-ENTIRE LENGTH IS FIXED LEADING EDGE         ,
 LL(2) = 0.0       ,DEF=55H INBOARD SLATS ONLY                                   ,
 LL(3) = 0.0       ,DEF=55H CENTER SLATS ONLY                                    ,
 LL(4) = 0.0       ,DEF=55H OUTBOARD SLATS ONLY                                  ,
 LL(5) = 0.0       ,DEF=55H INBOARD AND CENTER SLATS ONLY                        ,
 LL(6) = 0.0       ,DEF=55H CENTER AND OUTBOARD SLATS ONLY                       ,
 LL(7) = 0.0       ,DEF=55H INBOARD AND OUTBOARD SLATS ONLY                      ,
 LL(8) = 0.0       ,DEF=55H INBOARD,OUTBOARD AND CENTER SLATS ONLY               ,
 MATTYP=          2,DEF=55H MATERIAL TYPE                                        ,
C                             1 -7075 ALUMINUM                                   ,
C                             2 -2024 ALUMINUM                                   ,
C                             3 -DMS 1784 TITANIUM                               ,
C                             4 -17-7PH STAINLESS STEEL                          ,
C                             5 -SAE 1018 STEEL                                  ,
C                             6 -BORON-EPOXY COMPOSITE(0.005 IN)                 ,
C                             7 -BORON ALUMINUM COMPOSITE                        ,
C                             8 -GRAPHITE-EPOXY COMPOSITE                        ,
C                             9 -HEXCEL ALUMINUM HONEYCOMB (1/8 HEX 0.001 FOIL)  ,
                    DEF=55H F-111 WING TIP
 $END
```

Table J-3. Aileron Input.

```
PSINPNL
C
C   AX WING AILERONS
C
 MATTYP=2.
 LSURF=1.
 DWB=47.75.
 DWCT=4.5.
 GWFS=0.14.
 GWRS=0.535.
 DWCR=11.4.
 VS=100..
 QMAX=950..
 SIGCR=0.4486.
 CLMAX=2.5.
 NZ=7.5.
 SW=380..
 TST1=38300..
 DCSL=72..
 DCSWI=19.8.
 DCSWO=13.5.
 DCSYI=0.746.
 $END
```

Table J-4. Rudder Input.

```
PSINPNL
C
C   C-5A RUDDER-LOWER
C
 LSURF=2.
 MATTYP=2.
 DWB=222.7.
 DVCR=30.93.
 DVCT=24.75.
 GVRS=0.64.
 VS=100.0.
 QMAX=550.0.
 SIGCR=0.4486.
 CLMAX=4.5.
 NZ=3.75.
 SW=6200.0.
 TST1=769000.0.
 DCSL=208.15.
 DCSWI=133.63.
 DCSWO=133.63.
 $END
```

Table J-5. Elevator Input.

```
PSINPNL
C
C   C-5A INNER ELEVATOR HORIZONTAL
C
 MATTYP=2.
 LSURF=3.
 DWB=222.7.
 DHCR=21.6.
 DHCT=7.7.
 GHRS=0.65.
 VS=100.0.
 QMAX=550..
 SIGCR=0.4486.
 CLMAX=4.5.
 NZ=3.75.
 SW=6200.0.
 TST1=769000.0.
 DCSL=193.35.
 DCSWI=84.0.
 DCSWO=60..
 $END
```

Table J-6. Flap Input.

```
PSINPNL
C
C   AX WING FLAPS
C
 MATTYP=2.
 LSURF=4.
 DWB=47.75.
 DWCT=4.5.
 GWFS=0.14.
 GWRS=0.535.
 DWCR=11.4.
 VS=100..
 QMAX=950..
 SIGCR=0.4486.
 CLMAX=2.5.
 NZ=7.5.
 SW=380..
 TST1=38300..
 DCSL=182..
 DCSWI=23..
 DCSWO=15..
 GWCFLP=0.26.
 $END
```

Table J-7. Slat Input.

```
P$INPNL
C
C  AX WING SLATS
C
 MATTYP=2,
 LSURF=5,
 DWB=47.75,
 DWCT=4.5,
 GWFS=0.14,
 GWRS=0.535,
 DWCR=11.4,
 VS=100.,
 QMAX=950.,
 SIGCR=0.4486,
 CLMAX=2.5,
 NZ=7.5,
 SW=380.,
 TST1=38300.,
 D(1)=1.92,
 D(2)=5.0,
 D(3)=6.2,
 D(4)=17.0,
 D(5)=17.5,
 D(6)=23.0,
 DCSWI=1.3,
 DCSWO=0.8,
 DISWI=1.6,
 DISWO=1.4,
 DLESLC=10.8,
 DLESLI=2.75,
 DLESLO=5.83,
 DOSWI=0.8,
 DOSWO=0.65,
 CSCDWC=0.144,
 $END
```

Table J-8. Fore Flap Input.

```
P$INPNL
C
C  AX WING FOREFLAPS
C
 MATTYP=2,
 LSURF=6,
 GWCFFL=0.26,
 GWCFLP=0.26,
 DWB=47.75,
 DWCT=4.5,
 GWFS=0.14,
 GWRS=0.535,
 DWCR=11.4,
 VS=100.,
 QMAX=950.,
 SIGCR=0.4486,
 CLMAX=2.5,
 NZ=7.5,
 SW=380.,
 TST1=38300.,
 DCSL=182.,
 DCSWI=6.,
 DCSWO=4.,
 $END
```

Table J-9. Leading Edge Input

```
P$INPNL
C
C  F-111 FIN LEADING EDGE
C
 MATTYP=2,
 DFXLE =12.33    ,
 DFXWI =3.03     ,
 DFXWO =1.39     ,
 L     =       62,
 LSURF =        8,
 $END
```

Table J-10. Trailing Edge Input.

```
P$INPNL
C
C  C-141 STAB TE
C
 MATTYP=2,
 L=58,
 LSURF=10,
 GWTCR=0.106,
 GWTCT=0.106,
 DHB=50.35,
 GHRS=0.57,
 DHCR=14.06,
 DHCT=5.20,
 DBW=3.333,
 DHB=50.35,
.$END
```

Table J-11. Spoilers Input.

```
P$INPNL
C
C  F-111 SPOILERS
C
 DWCT  =3.824    ,DEF=55H  WING CHORD AT TIP (FT)                                   ,
 GWRS  =0.65     ,DEF=55H  LOCATION OF WING REAR SPAR  (PERCENT ROOT CHORD)         ,
 DWCR  =12.506   ,DEF=55H   WING CHORD AT THE ROOT (FT)                             ,
 DCSL  =267.4    ,DEF=55H  SURFACE LENGTH (IN)                                      ,
 DCSWI =21.7     ,DEF=55H  SURFACE CHORD AT INBOARD END  (IN)                       ,
 DCSWO =11.8     ,DEF=55H  SURFACE CHORD AT OUTBOARD END (IN)                       ,
 LSURF =        9,DEF=55H  SURFACE IDENTIFICATION FLAG                              ,
 MATTYP=2,
 CSCDWC=0.162    ,
 GWTCR =0.1135   ,
 GWTCT =0.085    ,
 GWCFLP=0.35     ,
 FLPTYP=0.0      ,
 DWB=60.533,
 DCSYI=0.2561,
 $END
```

WORKSHEET 4

Secondary Structure Weights

Secondary structure weights as compiled in Table J-12 are obtained from a series of output data exemplified by the sample output in Table J-13 from the leading edge-trailing edge synthesis program. Total weight of the component being estimated is shown in the lower left-hand corner. The treatment of correlation factors is the same as before.

Table J-12. Aerodynamic Surfaces Secondary Structure Weights.

A-X WING

Part Definition	Actual Weight	Synthesis Weight	Correlation Factors
Leading Edge & Tip	125	166	0.75
Trailing Edge	52	92	0.56
Ailerons	49	24	1.87
Flaps & Foreflaps	359	281	1.28
Slats	278	198	1.40
Spoilers	83	134	0.67

Does not include:

1. Miscellaneous Structure: 88 lbs
2. Aileron Balance Wts: 45 lbs

Table J-13. Sample Output.

```
PSINPHL
C
C. F-111 STAB TIP
C
MATTYP=2,
LSURF =      7,DEF=55H  SURFACE IDENTIFICATION FLAG                          ,
UHCT  =6.0    ,DEF=55H  HORIZONTAL CHORD AT TIP (FT)                         ,
DHTI  =1.2    ,DEF=55H  HORIZONTAL THICKNESS AT TIP (FT)                     ,
CHFS  =3.10   ,DEF=55H  LOCATION OF HORIZONTAL FRONT SPAR (PERCNT ROOT CHORD),
CHRS  =3.70   ,DEF=55H  LOCATION OF HORIZONTAL REAR SPAR (PERCENT ROOT CHORD),
$END

   SURF        PART          I       L     THEOWT     ACWT      MAWT      WTMA
HORIZ. TIP   L.E. SKIN       3      64       6.91      6.91      7.97      7.97
                           JJJ      JT         KK     HOLES      DIAM    QTSKIN    QTLSKN    STDOPT    STDHGT    STDLTH    STDWID
                             2       1         15    145.00       .19      0.00      0.00       .03     12.24     72.00     30.00
                           KEY  MATLID        DIA        EL      PERM       THK       WID        KT
                             3       2       0.00     72.00      0.00     12.24     30.00         1

   SURF        PART          I       L     THEOWT     ACWT      MAWT      WTMA
HORIZ. TIP   NOSE RIB 1     78      64        .05       .05       .13       .13
                           JJJ      JT         KK     HOLES      DIAM    QTSKIN    QTLSKN    STDOPT    STDHGT    STDLTH    STDWID
                             2       5         15      0.00      0.00      0.00      0.00       .03       .73     13.70      1.46
                           KEY  MATLID        DIA        EL      PERM       THK       WID        KT
                             3       2       0.00     13.70      0.00       .73      1.46         5

   SURF        PART          I       L     THEOWT     ACWT      MAWT      WTMA
HORIZ. TIP   IHR UP CAP    130      64        .91       .91      1.02      1.02
                           JJJ      JT         KK     HOLES      DIAM    QTSKIN    QTLSKN    STDOPT    STDHGT    STDLTH    STDWID
                             2       1         21     96.00       .19      0.00      0.00       .09       .00     64.00      1.52
                           KEY  MATLID        DIA        EL      PERM       THK       WID        KT
                             5       2       1.52     64.00      4.00       .00      1.52         1

   SURF        PART          I       L     THEOWT     ACWT      MAWT      WTMA
HORIZ. TIP   IHR LR CAP    131      64        .91       .91      1.02      1.02
                           JJJ      JT         KK     HOLES      DIAM    QTSKIN    QTLSKN    STDOPT    STDHGT    STDLTH    STDWID
                             2       1         21     96.00       .19      0.00      0.00       .09       .00     64.00      1.52
                           KEY  MATLID        DIA        EL      PERM       THK       WID        KT
                             5       2       1.52     64.00      4.00       .00      1.52         1

   SURF        PART          I       L     THEOWT     ACWT      MAWT      WTMA
HORIZ. TIP   IHR WEB       132      64       2.12      2.12      1.53      1.53
                           JJJ      JT         KK     HOLES      DIAM    QTSKIN    QTLSKN    STDOPT    STDHGT    STDLTH    STDWID
                             2       1          1    205.00       .19      0.00      0.00       .09       .03     64.00      2.24
                           KEY  MATLID        DIA        EL      PERM       THK       WID        KT
                             3       2       0.00     64.00      0.00       .03     12.24         1

       64

 TOTAL WEIGHT=    11.183
```

WORKSHEET 5

Dimensional Data

Dimensional data comes mainly from the primary source of the APAS input data: the 3 views and other design data developed by the supporting preliminary design process. The data required and the indication of source is given in Table J-14.

Table J-14. Dimensional Data Source.

DATA		SOURCE
SYMBOL	DESCRIPTION	
CN	No. of Cover Panels	D
RN	No. of ribs, frames	D
SNE	No. of external spars, longerons	D
SNI	No. of internal spars, longerons	D
SPE	Average spar perimeter in feet	D
RP	Average rib perimeter in feet	D
TS4	Average skin thickness in inches	A
WRRP	Root rib length (ft.)	D
CSO	Center section operator	D
FSL	Front spar length (ft.)	D
ERL	End rib length (ft.)	D
RSL	Rear spar length (ft)	D
TS7	Average skin thickness (in)	A
AS2	Surface area of component (ft^2)	D

A - APAS

D - Design Data

WORKSHEET 6

Inputs to F-N-L Program

The input requirement for a run of the computer program for development of aircraft fuselage, landing gear and nacelle weights is shown in Table J-15. This represents a complete set of inputs for the three components.

Table J-15. Inputs to F-N-L Weights Program.

```
PSDATA
C
 TITLE=60H B-58A-TEST-CASE                                               ,
C
 TK( 1)=1.0      ,DEF=55H  BASIC SHELL                                   ,
 TK( 2)=1.0      ,DEF=55H  COCKPIT PROVISIONS                            ,
 TK( 3)=1.0      ,DEF=55H  NLG PROVISIONS                                ,
 TK( 4)=1.0      ,DEF=55H  NLG CUTOUT / LOAD INTROD                      ,
 TK( 5)=1.0      ,DEF=55H  WING REACTION (BODY-TIE)                      ,
 TK( 6)=1.0      ,DEF=55H  TAIL PROVISIONS                               ,
 TK( 7)=1.0      ,DEF=55H  WINDSHIELD AND CANOPY                         ,
 TK( 8)=1.0      ,DEF=55H  FWD VERTICAL INERTIA                          ,
 TK( 9)=1.0      ,DEF=55H  AFT VERTICAL INERTIA                          ,
 TK(10)=1.0      ,DEF=55H  FWD SIDE BENDING                              ,
 TK(11)=1.0      ,DEF=55H  AFT SIDE BENDING                              ,
 TK(12)=1.0      ,DEF=55H  FWD FUEL INERTIA                              ,
 TK(13)=1.0      ,DEF=55H  AFT FUEL INERTIA                              ,
 TK(14)=0.0      ,DEF=55H  AFT ENGINE BENDING                            ,
 TK(15)=0.0      ,DEF=55H  AFT HORIZ. TAIL BENDING                       ,
 TK(16)=1.0      ,DEF=55H  FUEL PROVISIONS                               ,
 TK(17)=0.0      ,DEF=55H  ARRESTING GEAR PROVISIONS                     ,
 TK(18)=0.0      ,DEF=55H  CATAPULT/HOLDBACK FUS TOW                     ,
 TK(19)=0.0      ,DEF=55H  CATAPULT/HOLDBACK NLG TOW                     ,
 TK(20)=0.0      ,DEF=55H  ENGINE PROVISIONS                             ,
 TK(21)=0.0      ,DEF=55H  DUCT PROVISIONS                               ,
 TK(22)=0.0      ,DEF=55H  MLG DOORS                                     ,
 TK(23)=0.0      ,DEF=55H  MLG CUTOUT/LOAD INTROD                        ,
 TK(24)=1.0      ,DEF=55H  EXTERNAL STORES PROV                          ,
 TK(25)=0.0      ,DEF=55H  SPEED BRAKES                                  ,
 TK(26)=0.0      ,DEF=55H  BOMB/MISSLE BAY CUTOUT                        ,
 TK(27)=0.0      ,DEF=55H  B/M BAY DOORS+MECH CONVENT                    ,
 TK(28)=0.0      ,DEF=55H  B/M BAY DOORS+MECH ROTARY                     ,
 TK(29)=0.0      ,DEF=55H  CABIN FLOORING+SUPPORT TRN                    ,
 TK(30)=0.0      ,DEF=55H  CABIN WINDOWS TRANSPORTS                      ,
 TK(31)=0.0      ,DEF=55H  PRESSURE WEB+SEALANT TRN                      ,
 TK(32)=0.0      ,DEF=55H  AIR EXTRACTION PROV TRN                       ,
 TK(33)=0.0      ,DEF=55H  CARGO LOADING RAMP+ACC TRN                    ,
 TK(34)=0.0      ,DEF=55H  MLG EXTERNAL FAIRINGS                         ,
 TK(35)=0.0      ,DEF=55H  SIDE LOADING DOOR+MECH                        ,
 TK(36)=0.0      ,DEF=55H  CLAMSHELL DOORS+MECH                          ,
 TK(37)=0.0      ,DEF=55H  FLAT CARGO CLEARANCE                          ,
 TK(38)=0.0      ,DEF=55H  FUEL TANK FLOORING                            ,
 TK(39)=0.0      ,DEF=55H  SWING TAIL/NOSE PROVISIONS                    ,
 TK(40)=0.0      ,DEF=55H  OVER WING FAIRING                             ,
 TK(41)=0.0      ,DEF=55H  WING SLOT SEAL                                ,
 TK(42)=0.0      ,DEF=55H  WING GLOVE                                    ,
```

Table J-15. Inputs to F-N-L Weight Program (Continued).

```
TK(43)=0.0       ,DEF=55H  WINDSHIELD FAIRING AREA                                       ,
TK(44)=0.0       ,DEF=55H  BODY CONFIG. PENALTIES       (MISC WT.)                       ,
TK(45)=1.0       ,DEF=55H  FUSELAGE MISC WEIGHT(STATISTICAL CORRECTION)                  ,
TK(51)=0.0       ,DEF=55H  MLG STRUC-SINGLE WHEEL-VERT.COLUMN LAND BASED                 ,
TK(52)=0.0       ,DEF=55H  MLG STRUC-SINGLE WHEEL-VERT.COLUMN CARR BASED                 ,
TK(53)=1.0       ,DEF=55H  MLG STRUC-MULTIE WHEEL-VERT.COLUMN LAND BASED                 ,
TK(54)=0.0       ,DEF=55H  MLG STRUC-SINGLE WHEEL-TRIPOD TYPE LAND BASED                 ,
TK(55)=0.0       ,DEF=55H  MLG STRUC-SINGLE WHEEL-TRIPOD TYPE CARR BASED                 ,
TK(56)=1.0       ,DEF=55H  NLG STRUC-BOMBERS AND FIGHTERS      LAND BASED                ,
TK(57)=0.0       ,DEF=55H  NLG STRUC-TRANSPORTS                LAND BASED                ,
TK(58)=0.0       ,DEF=55H  NLG STRUC-FIGHTER + ATTACK FUS TOW CARR BASED                 ,
TK(59)=0.0       ,DEF=55H  NLG STRUC-FIGHTER + ATTACK NOS TOW CARR BASED                 ,
TK(60)=1.0       ,DEF=55H  MLG ROLLING STOCK -WHEELS HIGH PRS LAND BASED                 ,
TK(61)=0.0       ,DEF=55H  MLG ROLLING STOCK -WHEELS LOW PRS  LAND BASED                 ,
TK(62)=0.0       ,DEF=55H  MLG ROLLING STOCK -WHEELS HIGH PRS CARR BASED                 ,
TK(63)=0.0       ,DEF=55H  BRAKES -NO DRAG CHUTE                                         ,
TK(64)=1.0       ,DEF=55H  BRAKES -    DRAG CHUTE                                        ,
TK(65)=0.0       ,DEF=55H  TIRES-TYPE III AND VII                                        ,
TK(66)=0.0       ,DEF=55H  TIRES-TYPE VIII                                               ,
TK(67)=1.0       ,DEF=55H  NLG ROLLING STOCK                                             ,
TK(68)=1.0       ,DEF=55H  LANDING GEAR CONTROLS                                         ,
TK(80)=1.0       ,DEF=55H  EXT MOUNT JET ENGINE COWLING                                  ,
TK(81)=1.0       ,DEF=55H  EXT MOUNT JET ENGINE PYLON SINGLE ENGINE INSTALLATION,
TK(82)=0.0       ,DEF=55H  EXT MOUNT JET ENGINE PYLON SIAMESEENGINE INSTALLATION,
TK(83)=0.0       ,DEF=55H  EXT MOUNT TURBOPROP  COWLING                                  ,
TK(84)=0.0       ,DEF=55H  MAIN LANDING GEAR DOORS(JET-TURBOPROP)                        ,
TK(85)=0.0       ,DEF=55H  NACELLES WITH COWL FLAPS (PISTON ENGINE)                      ,
TK(86)=0.0       ,DEF=55H  NACELLES WITH AIR BAFFLES(PISTON ENGINE)                      ,
TK(87)=0.0       ,DEF=55H  MAIN LANDING GEAR DOORS  (PISTON ENGINE)                      ,
AF     =0.0      ,DEF=55H  CABIN FLOOR AREA  -SQ FT                                      ,
AGL    =0.0      ,DEF=55H  WINDOW AREA, CABIN, TRANSPORTS -SQ FT                         ,
BN     =4.01     ,DEF=55H  MAXIMUM NACELLE BREADTH-FT                                    ,
BODY   =0.0      ,DEF=55H  FIXED BODY WEIGHT-LBS                                         ,
FP     =72.      ,DEF=55H  WING SPAN ALONG 50 PC CHORD-FT                                ,
CD     =0.0      ,DEF=55H  SPEED BRAKE DRAG COEFFICIENT                                  ,
CE     =0.0      ,DEF=55H  INLET DUCT CIRCUMFERENCE AT ENGINE-FT/DUCT                    ,
CF     =0.0      ,DEF=55H  FUS CIRCUMFERANCE-FT                                          ,
CI     =0.0      ,DEF=55H  INLET DUCT CIRCUMFERENCE AT INLET-FT/DUCT                     ,
CL     =1.6      ,DEF=55H  LIFT COEFFICIENT LANDING CONFIGURATION                        ,
CSDA   =0.0      ,DEF=55H  CLAMSHELL OR AND MECH AREA-SQ FT/AP                           ,
DAF    =4.17     ,DEF=55H  AFT FUS AVG VERTICAL BENDING DEPTH-FT                         ,
DC     =0.0      ,DEF=55H  ULTIMATE ARRESTING HOOK DRAG COMPONENT-LB                     ,
DCK    =0.0      ,DEF=55H  D SUB-C CONSTANT (MULTIPLYING CONSTANT FOR DC)                ,
DE     =0.0      ,DEF=55H  ENGINE COMPARTMENT DIAMETER-FT                                ,
DFF    =4.83     ,DEF=55H  FWD FUS AVG VERTICAL BENDING DEPTH-FT                         ,
DMB    =0.0      ,DEF=55H  BOMB OR MISSILE BAY WIDTH-FT                                  ,
```

Table J-15. Inputs to F-N-L Weight Program (Continued).

```
DN      =4.5      ,DFF=55H  MAXIMUM NACELLE DEPTH-FT                              ,
DT      =0.0      ,DFF=55H  MAXIMUM OUTSIDE DIAMETER OF MLG TIRES-INS              ,
DWA     =2.75     ,DFF=55H  AFT FUS AVG SIDE BENDING WIDTH-FT                     ,
DWF     =3.31     ,DFF=55H  FWD FUS AVG SIDE BENDING WIDTH-FT                     ,
DWH     =12.      ,DFF=55H  BEAD LEDGE DIAMETER-INS                               ,
FCCDA   =0.0      ,DFF=55H  FLAT CGO CLEARANCE DR,AREA-SQ FT                      ,
FH      =0.0      ,DFF=55H  HORIZONTAL TAIL LOAD-LBS                              ,
FIXED   =0.0      ,DFF=55H  FIXED STRUCTURE (LANDING GEAR)-LBS                    ,
FLAG    =0.0      ,DFF=55H  0 BODY,NAC,LG-1 BODY-2 LG-3 NAC                       ,
FTFA    =0.0      ,DFF=55H  FUEL TANK FLOORING AREA-SQ FT                         ,
FV      =0.0      ,DFF=55H  VERTICAL TAIL LOAD-LBS                                ,
FVM     =0.0      ,DFF=55H  MAIN GEAR VERTICAL LOAD-LBS/SIDE                      ,
FVN     =0.0      ,DFF=55H  NOSE VERTICAL LOAD-LBS                                ,
GF      =3779.    ,DFF=55H  FUSELAGE FUEL CAPACITY (GALLONS)                      ,
HTVC    =.0714    ,DFF=55H  HORIZONTAL TAIL VOLUME COEFFICIENT                    ,
IPWT(1)=5174.     ,DFF=55H ACTUAL WEIGHT OF BODY GROUP-LB                         ,
IPWT(2)=3412.     ,DFF=55H ACTUAL WEIGHT LANDING GEAR GROUP-LB                    ,
IPWT(3)=4675.     ,DFF=55H ACTUAL WEIGHT NACELLE GROUP-LB                         ,
K       =19.9     ,DFF=55H  WINDSHIELD AND CANOPY CONSTANT                        ,
KB      =1.0      ,DFF=55H  BOMB BAY TYPE FACTOR                                  ,
KF      =.75      ,DFF=55H  FUS FUEL TANK CONSTANT                                ,
KG      =1.0      ,DFF=55H  FACTOR=1.0 NO GEAR IN NAC =1.265 GEAR IN NACELLE      ,
KMA     =.476     ,DFF=55H  MLG STRUCTURE TYPE FACTOR-1 TRAN-0.733 BOMBERS        ,
KMLD    =1.0      ,DFF=55H  MLG DOORS  TYPE CONSTANT                              ,
KN      =2.15     ,DFF=55H  NACELLE TYPE CONSTANT (SEE USERS GUIDE)               ,
KNO     =.47      ,DFF=55H  NOSE GEAR DESIGN CRITERIA-SFE MANUAL                  ,
KPYL    =1.0      ,DFF=55H  FACTOR=1 FOR MIL TRAN AND BOMB =2 COMMERCIAL          ,
KS      =.067     ,DFF=55H  EXTERNAL STORES CONSTANT                              ,
LAF     =14.83    ,DFF=55H  LENGTH( C/L WING BOX/ CG AFT FUEL)-FT                 ,
LAL     =30.17    ,DFF=55H  AFT LONGERON LENGTH C/L WING AFT-FT                   ,
LB      =34.5     ,DFF=55H  BRACE LENGTH- C/L TRUNNION TO DRAG BRACE FTG-INS      ,
LD      =0.0      ,DFF=55H  INLET DUCT LENGTH ( C/L DUCT)-FT/DUCT                 ,
LE      =0.0      ,DFF=55H  ENGINE COMPARTMENT LENGTH-FT                          ,
LESPYL=77.        ,DFF=55H  PYLON LEADING EDGE SWEEP ANGLE - DEGREES              ,
LEX     =120.3    ,DFF=55H  MLG EXTENDED LENGTH C/L(TRUN/AXLE)-INS                ,
LEXN    =139.9    ,DFF=55H  NLG EXTENDED LENGTH C/L(TRUN/AXLE)-INS                ,
LFF     =3.75     ,DFF=55H  LENGTH( C/L WING BOX/ CG FWD FUEL)-FT                 ,
LFL     =41.25    ,DFF=55H  FWD LONGERON LENGTH C/L WING/ R BHD-FT                ,
LFLR    =0.0      ,DFF=55H  CARGO FLOOR LENGTH-FT                                 ,
LGF     =0.0      ,DFF=55H  LANDING GEAR FAIRING LENGTH-FT                        ,
LHT     =0.0      ,DFF=55H  LENGTH( C/L WING BOX/ C/L HT BOX )-FT                 ,
LMB     =0.0      ,DFF=55H  TOTAL BOMB OR MISSILE BAY LENGTH-FT                   ,
LN      =22.28    ,DFF=55H  NACELLE COWL LENGTH- FT                               ,
LNX     =0.0      ,DFF=55H  NOT USED                                              ,
LPP     =0.0      ,DFF=55H  LENGTH( C/L WING BOX/ CG ENG INSTL)-FT                ,
LRA     =0.0      ,DFF=55H  CGO RAMP LENGTH -FT.                                  ,
LTR     =0.0      ,DFF=55H  STRUT LENGTH ABOVE TRUNNION-INS                       ,
```

Table J-15. Inputs to F-N-L Weight Program (Continued).

LVT	=27.25	,DEF=55H	LENGTH (C/L WING BOX/ C/L FIN BOX)-FT	,
LWS	=0.0	,DEF=55H	LENGTH OF WING SLOT-FT	,
NJ	=0.0	,DEF=55H	NUMBER OF INLET DUCTS	,
NE	=0.0	,DEF=55H	NUMBER OF ENGINES PER AIRPLANE	,
NF	=3.0	,DEF=55H	NUMBER OF FUSELAGE FUEL TANKS	,
NG	=0.0	,DEF=55H	NUMBER OF MLG INSTALLATIONS PER A/P	,
NL	=3.5	,DEF=55H	DESIGN LANDING ULTIMATE LOAD FACTOR	,
NN	=4.0	,DEF=55H	NUMBER OF LIKE NACELLES PER AIRPLANE	,
NPYL	=2.0	,DEF=55H	NUMBER OF LIKE PYLONS PER AIRPLANE	,
NS	=0.0	,DEF=55H	NUMBER OF STORE STATIONS	,
NS1	=1.0	,DEF=55H	NUMBER OF STORE STATIONS 1	,
NS2	=0.0	,DEF=55H	NUMBER OF STORE STATIONS 2	,
NSB	=0.0	,DEF=55H	NUMBER OF SPEED BRAKES	,
NST	=2.0	,DEF=55H	NUMBER OF MLG STRUTS PER AP	,
NT	=3.0	,DEF=55H	TAXI LOAD FACTOR-ULTIMATE	,
NTI	=0.0	,DEF=55H	NUMBER MAIN LANDING TIRES PER AIRPLANE	,
NWH	=16.	,DEF=55H	NUMBER MAIN LANDING GEAR WHEELS	,
NX	=0.0	,DEF=55H	CATAPULT LOAD FACTOR (ULTIMATE)	,
PC	=14.9	,DEF=55H	ULTIMATE CABIN PRESSURE	,
PCW	=0.0	,DEF=55H	SEE MANUAL	,
PD	=0.0	,DEF=55H	DUCT PRESSURE-PSI (COMPUTED IF BLANK)	,
Q	=1336.	,DEF=55H	MAX OPERATING DYNAMIC PRESSURE-PSF	,
SC	=153.	,DEF=55H	WINDSHIELD AND CANOPY AREA-SQ FT	,
SDA	=0.0	,DEF=55H	SIDE LOADING DOOR AND MECH-SQ FT	,
SFF	=1220.	,DEF=55H	FUSELAGE WETTED AREA MINUS CUTOUTS-SQ FT	,
SFW	=0.0	,DEF=55H	WINDSHIELD FAIRING AREA-SQ FT	,
SGF	=0.0	,DEF=55H	LANDING GEAR FAIRING AREA-SQ FT	,
SGL	=0.0	,DEF=55H	GLOVE SURFACE AREA-SQ FT	,
SM	=15.	,DEF=55H	MLG STROKE (INCHES)	,
SMB	=0.0	,DEF=55H	MISSILE OR BOMB BAY DR., FT SQ	,
SMD	=0.0	,DEF=55H	MLG DOOR AREA-SQ FT	,
SN	=259.	,DEF=55H	NACELLE COWL SURFACE AREA-FT SQ/ NAC	,
SND	=27.6	,DEF=55H	NLG DOOR AREA-SQ FT	,
SPYL	=56.	,DEF=55H	PYLON PLANFORM AREA - FT SQ/ NACELLE	,
SRA	=0.0	,DEF=55H	CARGO RAMP AREA-SQ FT	,
SSB	=0.0	,DEF=55H	SPEED BRAKE AREA EACH-SQ FT	,
SW	=1542.5	,DEF=55H	WING AREA-THEO SQ FT	,
SWF	=0.0	,DEF=55H	OVER WING FAIRING AREA-SQ FT	,
SWP	=0.0	,DEF=55H	CARGO AND PASS COMPARTMENT WETTED AREA-SQ FT	,
TAILB	=0.5	,DEF=55H	TAIL BUMPER WEIGHT-LBS	,
TIRWT	=444.	,DEF=55H	TIRE WEIGHT IF INPUT-LBS	,
TPE	=0.0	,DEF=55H	THRUST PER ENGINE-LBS	,
TYPE	=2.0	,DEF=55H	FLAG (0 USAF, 1USN, 2 BOMBER, 3 TRANSPORT)	,
ULF	=3.0	,DEF=55H	FLIGHT DESIGN ULTIMATE LOAD FACTOR	,
VC	=169	,DEF=55H	COCKPIT VOLUME-CU FT	,
VS	=0.0	,DEF=55H	STALL SPEED (COMPUTED IF BLANK)-FT/SEC	,

Table J-15. Inputs to F-N-L Weight Program (Continued).

```
WAI    =5972.   ,DEF=55H  WT AFTBODY EXCLUD.FUEL AFT C/L WING-LBS         ,
WC     =0.0     ,DEF=55H  CATAPULT DESIGN GROSS WEIGHT-LBS                ,
WDES   =163000. ,DEF=55H  DESIGN GROSS WEIGHT-LBS                         ,
WF     =0.0     ,DEF=55H  1 G DESIGN FLOOR LOADING-LBS                    ,
WFA    =19578.  ,DEF=55H  WT AFTBODY FUEL AT DESIGN CONDITION-LBS         ,
WFF    =5378.   ,DEF=55H  WT FWDBODY FUEL AT DESIGN CONDITION-LBS         ,
WFL    =5.0     ,DEF=55H  WHEEL WIDTH BETWEEN FLANGES-INS                 ,
WFI    =3135.   ,DEF=55H  WT FWDBODY EXCLUD.FUEL FWD C/L WING-LBS         ,
WLAND  =95000.  ,DEF=55H  DESIGN LANDING WEIGHT-LBS                       ,
WMAX   =163000. ,DEF=55H  MAXIMUM GROSS WEIGHT-LBS                        ,
WNC    =3750.   ,DEF=55H  WEIGHT OF NACELLE CONTENTS-LBS                  ,
WPP    =0.0     ,DEF=55H  WT OF ENGINE INSTALLATION-LBS                   ,
WS     =0.0     ,DEF=55H  DESIGN STORE WEIGHT PER STA-LBS                 ,
WS1    =36470.  ,DEF=55H  WT AT STORE STATION 1-LBS                       ,
WS2    =0.0     ,DEF=55H  WT AT STORE STATION 2-LBS                       ,
WTI    =0.0     ,DEF=55H  TIRE MAXIMUM SECTION WIDTH-INS                  ,
WTP(1,1)=2877.  ,DEF=55H INPUT FROM APAS - PANELS-LB                      ,
WTP(2,1)=178.   ,DEF=55H INPUT FROM APAS - LONGERONS-LB                   ,
WTP(3,1)=537.   ,DEF=55H INPUT FROM APAS - FRAMES-LB                      ,
WTP(4,1)=485.   ,DEF=55H INPUT FROM APAS - WEBS-LB                        ,
WTP(5,1)=0.0    ,DEF=55H INPUT FROM APAS - NON-STRUCTURAL-LB              ,
WWE    =0.0     ,DEF=55H  MAX WEAPON WT-LBS                               ,
$END
```

WORKSHEET 7

Fuselage - Nacelles - Landing Gear Weights Data

Output data from the F-N-L weights program is obtained in three parts, for fuselage, nacelles, and landing gear, as shown in Tables J-16, J-17, and J-18, respectively.

Table J-16. Fuselage Weights Data.

BODY WEIGHT - B-58A-TEST-CASE

		PANELS	LONGERONS	FRAMES	WEBS	NON STRUC	HORZ-TOTALS
BASIC SHELL	1783.0	2877.0	178.0	537.0	488.0	0.0	4083.0
COCKPIT PROVISIONS	222.0	55.5	55.5	22.2	66.6	22.2	222.0
NLG DOOR	104.0	93.6	10.4	0.0	0.0	0.0	104.0
NLG CUTOUT / LOAD INTRODUCTION	76.0	0.0	60.8	15.2	0.0	0.0	76.0
WING REACTION BODY TIE	282.0	141.0	28.2	112.8	0.0	0.0	282.0
TAIL PROVISIONS	157.0	78.5	78.5	0.0	0.0	0.0	157.0
WINDSHIELD AND CANOPY	957.0	0.0	0.0	0.0	0.0	957.0	957.0
FWD VERTICAL INERTIA	34.0	0.0	0.0	0.0	0.0	0.0	0.0
AFT VERTICAL INERTIA	42.0	0.0	0.0	0.0	0.0	0.0	0.0
FWD SIDE BENDING	188.0	0.0	0.0	0.0	0.0	0.0	0.0
AFT SIDE BENDING	354.0	0.0	0.0	0.0	0.0	0.0	0.0
FWD FUEL INERTIA	7.0	0.0	0.0	0.0	0.0	0.0	0.0
AFT FUEL INERTIA	77.0	0.0	0.0	0.0	0.0	0.0	0.0
AFT ENGINE BENDING	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AFT HORIZ TAIL BENDING	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FUEL PROVISIONS	546.0	0.0	0.0	0.0	0.0	0.0	0.0
ARRESTING GEAR PROVISIONS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CATAPULT/HOLDBACK FUS TOW	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CATAPULT/HOLDBACK NLG TOW	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ENGINE PROVISIONS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DUCT PROVISIONS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MLG DOORS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MLG CUTOUT/LOAD INTROD	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EXTERNAL STORES PROV	208.0	41.6	62.4	104.0	0.0	0.0	208.0
SPEED BRAKES	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BOMB/MISSLE BAY CUTOUT	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B/M BAY DOORS+MECH CONVENT	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B/M BAY DOORS+MECH ROTARY	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CABIN FLOORING+SUPPORT TRN	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CABIN WINDOWS TRANSPORTS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PRESSURE WEB+SEALANT TRN	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AIR EXTRACTION PROV TRN	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CARGO LOADING RAMP+ACC TRN	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MLG EXTERNAL FAIRINGS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SIDE LOADING DOOR+MECH	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CLAMSHELL DOORS+MECH	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FLAT CARGO CLEARANCE DOORS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FUEL TANK FLOORING	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SWING TAIL/NOSE PROVISIONS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OVER WING FAIRING	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table J-16. Fuselage Weights Data (Continued).

WING SLOT SEAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WING GLOVE	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WINDSHIELD FAIRING	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BODY CONFIG PENALTIES	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FUSELAGE MISC WEIGHT	217.0	43.4	43.4	43.4	43.4	43.4	217.0
TOTAL BODY	5314.0	3330.6	517.2	834.6	598.0	1022.6	6303.0
BODY ACTUAL WEIGHT	5174.0						
BODY PREDICTED WEIGHT	6303.0						
EMPIRICAL WEIGHT FACTOR	.974						
SEMI-ANALYTICAL FACTOR	.821						

Table J-17. Nacelle Weights Data.

NACELLE WEIGHT B-58A TEST CASE

JET ENGINE COWLING	3539.1
JET ENGINE PYLONS SINGLE ENGINE	1037.2
JET ENGINE PYLONS SIAMESE ENGINE	0.0
TURBOPROP COWLING	0.0
TURBOPROP MAIN LANDING GEAR DOOR	0.0
PISTON ENGINES NAC WITH COWL FLAPS	0.0
PISTON ENGINES NAC WITH AIR PLUGS	0.0
PISTON ENGINES MAIN LANDING GEAR DOORS	0.0
TOTAL NACELLE GROUP	4576.3
ACTUAL WEIGHT	4675.0
WEIGHT FACTOR	1.022

Table J-18. Landing Gear Weights Data.

LANDING GEAR B-58A TEST CASE

OUTPUT

VS-LANDING CONF.POWER OFF STALL SPEED KNOTS	139.46
DESIGN LOAD /1000.	489.00
DRAG BRACE RATIO	.54
KE-KINETIC ENERGY/1000 FT-LB	140592.56

WEIGHTS

MLG STRUC-SINGLE WHEEL-VERT.COLUMN	LAND BASED	0.0
MLG STRUC-SINGLE WHEEL-VERT.COLUMN	CARR BASED	0.0
MLG STRUC-MULTI WHEEL-VERT.COLUMN	LAND BASED	1588.0
MLG STRUC-SINGLE WHEEL-TRIPOD TYPE	LAND BASED	0.0
MLG STRUC-SINGLE WHEEL-TRIPOD TYPE	CARR BASED	0.0
NLG STRUC-BOMBERS AND FIGHTERS	LAND BASED	249.0
NLG STRUC-TRANSPORTS	LAND BASED	0.0
NLG STRUC-FIGHTER + ATTACK FUS TOW	CARR BASED	0.0
NLG STRUC-FIGHTER + ATTACK NOS TOW	CARR BASED	0.0
MLG ROLLING STOCK -WHEELS HIGH PRS	LAND BASED	395.0
MLG ROLLING STOCK -WHEELS LOW PRS	LAND BASED	0.0
MLG ROLLING STOCK -WHEELS	CARR BASED	0.0
BRAKES -NO DRAG CHUTE		0.0
BRAKES -DRAG CHUTE		580.0
TIRES-TYPE III AND VII		0.0
TIRES-TYPE VIII		0.0
TIRE WT. INPUT		444.0
NLG ROLLING STOCK		107.0
LANDING GEAR CONTROLS		388.0
TAIL BUMPER WT.		0.0
FIXED STRUCTURE		0.0

TOTAL LANDING GEAR	3751.0
ACTUAL WEIGHT	3412.0
WEIGHT FACTOR	.910

APPENDIX K

AIRFRAME SYSTEM COST ESTIMATING PROGRAM MODULE

This appendix provides data to describe the system cost estimating computer program module, consisting of a listing of input elements, a listing of the program model card and NAMELIST variable input cards, the SAV matrix printout, a NAMELIST variables dictionary, and a summary of F-card coefficients. The NAMELIST variables dictionary provides for the entry of an input value thus also serving as an input summary table. The summary of F-card coefficients references the location of availabel back-up data that will be found either in Appendix I or Appendix L: the former if used for both trade and system methods and the latter if used only for the system method.

A. INPUT ELEMENTS

The input elements involved in the system costing method are listed in the following pages. The values in the second column, which are nominally for the horizontal stabilizer, are meaningless in this case having been carried forward by convention from the first column.

[illegible]	[illegible]	[illegible]	[illegible]	0.	0.	0.
[illegible]	[illegible]	[illegible]	0.	0.	0.	0.
[illegible]	[illegible]	[illegible]	[illegible]	0.	0.	0.
PC111	[illegible]	[illegible]	0.	0.	0.	0.
[illegible]	[illegible]	[illegible]	0.	0.	0.	0.
PC11[illegible]	[illegible]	0.	0.	0.	0.	0.
[illegible]	[illegible]	[illegible]	[illegible]	0.	0.	0.
[illegible]	[illegible]	[illegible]	0.	0.	0.	0.
PC116	0.	[illegible]	0.	0.	0.	0.
PC117	0.	[illegible]	0.	[illegible]	0.	0.
[illegible]	[illegible]	[illegible]	0.	0.	0.	0.
[illegible]	[illegible]	[illegible]	0.	0.	0.	0.
[illegible]	[illegible]	[illegible]	[illegible]	0.	0.	0.
[illegible]	[illegible]	0.	0.	0.	0.	0.
[illegible]	0.	0.	0.	0.	0.	0.
[illegible]	[illegible]	[illegible]	0.	0.	0.	0.
PC23	[illegible]	0.	0.	0.	0.	0.
PC24	0.	0.	0.	0.	0.	0.
PC25	0.	[illegible]	0.	0.	0.	0.
PC26	[illegible]	0.	0.	0.	0.	0.
PC27	0.	0.	0.	0.	0.	0.
PC28	[illegible]	[illegible]	0.	0.	0.	0.
PC29	0.	[illegible]	0.	0.	0.	0.
PC210	[illegible]	[illegible]	0.	0.	0.	0.
PC211	0.	0.	0.	0.	0.	0.
PC212	[illegible]	0.	0.	0.	0.	0.
PC213	0.	0.	0.	0.	0.	0.
PC214	0.	0.	0.	0.	0.	0.
PC215	0.	0.	0.	0.	0.	0.
PC216	0.	0.	0.	0.	0.	0.
PC217	0.	0.	0.	0.	0.	0.
PC218	0.	0.	0.	0.	0.	0.
PC219	0.	0.	0.	0.	0.	0.
PC220	0.	0.	0.	0.	0.	0.
PC221	0.	0.	0.	0.	0.	0.
PC31	0.	0.	0.	0.	0.	0.
PC32	0.	0.	0.	0.	0.	0.
PC33	0.	0.	0.	0.	0.	0.
PC34	0.	0.	0.	0.	0.	0.
PC35	0.	0.	0.	0.	0.	0.
PC36	0.	0.	0.	0.	0.	0.
PC37	0.	0.	0.	0.	0.	0.
PC38	0.	0.	0.	0.	0.	0.
PC39	0.	0.	0.	0.	0.	0.
PC310	0.	0.	0.	0.	0.	0.
PC311	0.	0.	0.	0.	0.	0.
PC312	0.	0.	0.	0.	0.	0.
PC313	0.	0.	0.	0.	0.	0.
PC314	0.	0.	0.	0.	0.	0.
PC315	0.	0.	0.	0.	0.	0.
PC316	0.	0.	0.	0.	0.	0.
PC317	0.	0.	0.	0.	0.	0.
PC318	0.	0.	0.	0.	0.	0.
PC319	0.	0.	0.	0.	0.	0.
PC320	0.	0.	0.	0.	0.	0.
PC321	0.	0.	0.	0.	0.	0.
WW	1.22E+04	1.22E+04	1.22E+04	1.22E+04	1.22E+04	1.22E+04
WH	0.	0.	0.	0.	0.	0.
WV	0.	0.	1.23E+03	1.23E+03	1.23E+03	1.23E+03
WF	0.	0.	0.	5.07E+03	5.07E+03	5.07E+03
WN	0.	0.	0.	0.	4.67E+03	4.67E+03

WL	0.	0.	0.	[illegible]	[illegible]	[illegible]
E1	6.0[illegible]E-01	6.0[illegible]E-01	[illegible]	[illegible]	[illegible]	[illegible]E-01
E2	6.0[illegible]E-01	6.[illegible]E-01	[illegible]	[illegible]	[illegible]	[illegible]E-01
F1	2.09E+00	2.09E+00	[illegible]	[illegible]	[illegible]	[illegible]E+00
F2	0.	0.	[illegible]	[illegible]	[illegible]	[illegible]
F3	0.	0.	[illegible]	[illegible]	[illegible]	[illegible]E+00
F4	0.	0.	[illegible]	[illegible]	[illegible]	[illegible]
F5	0.	0.	[illegible]	[illegible]	[illegible]	[illegible]
F6	0.	0.	[illegible]	[illegible]	[illegible]	[illegible]E+00
F7	2.1[illegible]E+00	2.1[illegible]E+00	[illegible]	[illegible]	[illegible]	[illegible]E+00
WAMP	3.4[illegible]E+04	[illegible]E+04	[illegible]	[illegible]	[illegible]	[illegible]E+04
F8	2.[illegible]E+00	2.[illegible]E+00	[illegible]	[illegible]	[illegible]	[illegible]E+00
W[illegible]	1.1[illegible]	0.	[illegible]	[illegible]	[illegible]	[illegible]
F9	2.[illegible]	2.[illegible]E+00	[illegible]	[illegible]	[illegible]	[illegible]
W[illegible]	1.0[illegible]	0.	0.	[illegible]	[illegible]	[illegible]
F10	2.[illegible]	2.[illegible]E+00	[illegible]	[illegible]	[illegible]	[illegible]
WHP	4.8[illegible]	0.	0.	[illegible]	[illegible]	[illegible]
F11	2.[illegible]	2.[illegible]E+00	2.[illegible]	[illegible]	[illegible]	[illegible]E+00
WP1	1.43E+0[illegible]	0.	[illegible]	[illegible]	[illegible]	[illegible]
F12	2.[illegible]	2.[illegible]E+00	[illegible]	[illegible]	[illegible]	[illegible]
WI	3.97E+0[illegible]	0.	[illegible]	[illegible]	[illegible]	[illegible]
F13	2.0[illegible]	2.09E+00	[illegible]	[illegible]	[illegible]	[illegible]
WAP	0.	0.	0.	0.	0.	[illegible]
F14	1.0[illegible]	1.0[illegible]E+0[illegible]	1.[illegible]	1.[illegible]	1.[illegible]	[illegible]E+00
WA	9.75E+0[illegible]	0.	0.	0.	0.	0.
F15	1.00E+00	1.0[illegible]E+00	1.[illegible]	1.[illegible]	1.[illegible]	[illegible]E+00
WFA	5.1[illegible]E+0[illegible]	0.	0.	0.	0.	[illegible]
F16	1.50E+00	1.50E+00	1.[illegible]E+00	1.[illegible]	1.[illegible]	[illegible]E+00
WF5	1.2[illegible]E+0[illegible]	0.	0.	0.	0.	0.
F17	1.50E+00	1.5[illegible]E+00	1.[illegible]	1.[illegible]	1.[illegible]E+00	1.[illegible]E+00
WAD	9.5[illegible]	0.	0.	0.	0.	0.
F18	2.09E+00	2.09E+00	2.[illegible]E+00	[illegible]	2.[illegible]	[illegible]E+00
FW	9.01E+0[illegible]	0.	0.	0.	0.	0.
FCLM1	6.56E+00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
FM	2.09E-01	2.09E-01	[illegible]E-01	[illegible]	[illegible]E-01	[illegible]
T1	7.50E-01	7.50E-01	7.[illegible]E-01	7.[illegible]	[illegible]	[illegible]E-01
TF1	2.09E+00	2.09E+00	[illegible]E+00	[illegible]	[illegible]	[illegible]
TF2	0.	0.	0.	0.	0.	0.
TF3	0.	0.	1.[illegible]E+00	1.[illegible]	1.[illegible]	[illegible]E+00
TF4	0.	0.	0.	1.7[illegible]	1.7[illegible]	[illegible].70E+00
TF5	0.	0.	0.	[illegible]	[illegible]	[illegible]E+00
TF6	0.	0.	0.	0.	0.	[illegible]E+00
TF7	2.09E+00	2.09E+0[illegible]	2.[illegible]E+00	[illegible]	[illegible]	[illegible]E+00
R	3.0[illegible]E+00	3.09E+00	3.0[illegible]E+00	3.[illegible]	3.0[illegible]	[illegible]E+00
TR	1.40E-01	1.40E-01	1.40[illegible]-01	1.[illegible]	1.[illegible]	1.[illegible]E-01
TMLR	6.5[illegible]E+00	[illegible].5[illegible]E+00	6.[illegible]E+00	[illegible]	[illegible]	[illegible]E+00
TFF	4.09E-01	4.09E-01	4.0[illegible]E-01	4.0[illegible]E-01	4.[illegible]E-01	4.09E-01
RTFF	1.50E-01	1.50E-01	1.[illegible]E-01	1.[illegible]	1.[illegible]E-01	[illegible]E-01
TFLR	5.94E+00	5.94E+00	5.94E+00	[illegible]	[illegible]	[illegible]
TMFR	2.09E+00	2.09E+00	2.0[illegible]	[illegible]	2.0[illegible]	[illegible]E+00
MAF	1.50E-01	1.50E-01	1.[illegible]E-01	1.[illegible]	1.5[illegible]E-01	1.50E-01
MALR	6.94E+00	6.94E+00	6.94E+00	[illegible]	[illegible]	[illegible]E+00
MDF	1.50E-01	1.50E-01	1.[illegible]E-01	1.[illegible]	1.5[illegible]E-01	1.5[illegible]E-01
MDLR	6.94E+00	6.94E+00	6.94E+00	6.94E+00	[illegible]E+00	[illegible]E+00
S	1.40E+03	1.40E+03	1.40E+03	1.40E+03	1.4[illegible]E+03	1.40E+03
QD	3.0[illegible]E+01	3.09E+01	3.0[illegible]E+01	3.[illegible]E+01	3.0[illegible]E+01	3.[illegible]E+01
RI	0.	0.	0.	0.	0.	0.
Y	1.975E+03	1.975E+03	1.97[illegible]E+03	1.[illegible]E+03	1.97[illegible]E+03	1.97[illegible]E+03
QCF1	6.00E-02	6.00E-02	6.00E-02	6.[illegible]	6.00E-02	[illegible]E-02
QCF2	1.50E-01	1.50E-01	1.50E-01	1.[illegible]E-01	1.5[illegible]E-01	1.50E-01
QCLR2	6.84E+00	6.84E+00	6.84E+00	6.84E+00	6.84E+00	6.84E+00

H	0.	0.	0.	0.	0.	0.
UF1	4.00E+00	4.00E+00	4.00E+00	4.00E+00	4.00E+00	4.00E+00
UF2	0.	0.	0.	0.	0.	0.
UF3	0.	0.	2.00E+00	2.00E+00	2.00E+00	2.00E+00
UF4	0.	0.	0.	6.00E+00	6.00E+00	6.00E+00
UF5	0.	0.	0.	0.	2.00E+00	2.00E+00
UF6	0.	0.	0.	0.	0.	1.50E+00
UF7	6.50E+00	6.50E+00	6.50E+00	6.50E+00	6.50E+00	6.50E+00
UF8	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00
UF9	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
UF10	2.00E+00	2.00E+00	2.00E+00	2.00E+00	2.00E+00	2.00E+00
UF11	2.00E+00	2.00E+00	2.00E+00	2.00E+00	2.00E+00	2.00E+00
UF12	2.00E+00	2.00E+00	2.00E+00	2.00E+00	2.00E+00	2.00E+00
UF13	2.00E+00	2.00E+00	2.00E+00	2.00E+00	2.00E+00	2.00E+00
UF14	2.00E+00	2.00E+00	2.00E+00	2.00E+00	2.00E+00	2.00E+00
UF15	2.00E+00	2.00E+00	2.00E+00	2.00E+00	2.00E+00	2.00E+00
UF16	2.00E+00	2.00E+00	2.00E+00	2.00E+00	2.00E+00	2.00E+00
UF17	2.00E+00	2.00E+00	2.00E+00	2.00E+00	2.00E+00	2.00E+00
QN1	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
QN2	3.00E+01	3.00E+01	3.00E+01	3.00E+01	3.00E+01	3.00E+01
QN3	8.60E+01	8.60E+01	8.60E+01	8.60E+01	8.60E+01	8.60E+01
QN4	1.16E+02	1.16E+02	1.16E+02	1.16E+02	1.16E+02	1.16E+02
QN5	0.	0.	0.	0.	0.	0.
QN6	3.00E+01	3.00E+01	3.00E+01	3.00E+01	3.00E+01	3.00E+01
ES	2.00E-01	2.00E-01	2.00E-01	2.00E-01	2.00E-01	2.00E-01
ECLR2	6.56E+00	6.56E+00	6.56E+00	6.56E+00	6.56E+00	6.56E+00
TU	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01
TMEC	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00
QC11	7.80E-01	7.80E-01	7.80E-01	7.80E-01	7.80E-01	7.80E-01
QC21	7.80E-01	7.80E-01	7.80E-01	7.80E-01	7.80E-01	7.80E-01
QC31	7.80E-01	7.80E-01	7.80E-01	7.80E-01	7.80E-01	7.80E-01
QC12	0.	7.80E-01	7.80E-01	7.80E-01	7.80E-01	7.80E-01
QC22	0.	7.80E-01	7.80E-01	7.80E-01	7.80E-01	7.80E-01
QC32	0.	7.80E-01	7.80E-01	7.80E-01	7.80E-01	7.80E-01
QC13	0.	0.	7.80E-01	7.80E-01	7.80E-01	7.80E-01
QC23	0.	0.	7.80E-01	7.80E-01	7.80E-01	7.80E-01
QC33	0.	0.	7.80E-01	7.80E-01	7.80E-01	7.80E-01
QC14	0.	0.	0.	7.80E-01	7.80E-01	7.80E-01
QC24	0.	0.	0.	7.80E-01	7.80E-01	7.80E-01
QC34	0.	0.	0.	7.80E-01	7.80E-01	7.80E-01
QC15	0.	0.	0.	0.	7.80E-01	7.80E-01
QC25	0.	0.	0.	0.	7.80E-01	7.80E-01
QC35	0.	0.	0.	0.	7.80E-01	7.80E-01
QC16	0.	0.	0.	0.	0.	8.00E-01
QC26	0.	0.	0.	0.	0.	8.00E-01
QC36	0.	0.	0.	0.	0.	8.00E-01
QC17	8.30E-01	8.30E-01	8.30E-01	8.30E-01	8.30E-01	8.30E-01
QC27	8.30E-01	8.30E-01	8.30E-01	8.30E-01	8.30E-01	8.30E-01
QC37	8.30E-01	8.30E-01	8.30E-01	8.30E-01	8.30E-01	8.30E-01

B. INPUT DATA DECK LISTING - NAMELIST VARIABLES AND MODEL CARDS

A complete listing of NAMELIST input cards and the program model cards is contained in the following seven pages.

```
[illegible] MHO=0.1[illegible],MALP=[illegible].94,[illegible]
[illegible] DC12=.78,
[illegible],W=1000.,[illegible]=.78,DC23=.78,DC33=.78,
[illegible],W[illegible]1000.,DC14=.78,DC24=.78,DC34=.78,
[illegible],W=[illegible]0.,DC15=.78,DC25=.78,DC35=.78,
[illegible]=1.25,[illegible]=1.5,W=0000.,DC16=.8,DC26=.8,DC36=.8,
```

```
C
C                           B-58  TEST CASE
C                           USE OF DECIMAL IMPLIES UNITS IN MILLIONS
C
C                    AEROSPACE VEHICLE AIRFRAME SYSTEM COSTS
C
C NONRECURRING DESIGN AND DEVELOPMENT COSTS
T
C
C ENGINEERING
C
C      BASIC STRUCTURE DESIGN ENGR.
F701  1   F1 WNG * 540.0 * WW WNG**E1 WNG
D         WING
F702  1   F2 HTL * 473.0 * WH HTL**E1 HTL
D         HORIZONTAL STABILIZER
F703  1   F3 VTL * 403.0 * WV VTL**E1 VTL
D         VERTICAL STABILIZER
F704  1   F4 FLG * 1200.0 * WF FLG**E1 FLG
D         FUSELAGE
F705  1   F5 NAC * 1200.0 * WN NAC**E1 NAC
D         NACELLE
F706  1   F6 LDG * 561.0 * WL LDG**E1 LDG
D         LANDING GEAR
C
F707  1   F7 WNG * 1840.0 * WAMP WNG**E2 WNG
D      CONFIGURATION DESIGN ENGRG
C
C      EQUIPMENT DESIGN
F711  1    F8 WNG * 1600.0 * WS WNG**E1 WNG
D          SURFACE CONTROLS
F712  1    F9 WNG * 1175.0 * WEC WNG**E1 WNG
D          ENVIRONMENTAL CONTROL SYS
F713  1    F10 WNG * 1110.0 * WHP WNG**E1 WNG
D          HYDRAULICS/PNEUMATICS
F714  1    F11 WNG * 1310.0 * WE1 WNG**E1 WNG
D          ELECTRICAL
F715  1    F12 WNG * 1500.0 * WI WNG**E1 WNG
D          INSTRUMENTS
F716  1    F13 WNG * 1510.0 * WAP WNG**E1 WNG
D          AUXILIARY POWER UNIT
F717  1    F14 WNG * 920.0 * WA WNG**E1 WNG
D          ARMAMENT PROVISIONS
F718  1    F15 WNG * 1100.0 * WEA WNG**E1 WNG
D          ENGINE ASSOCIATED EQUIP
F719  1    F16 WNG * 1100.0 * WFS WNG**E1 WNG
D          FUEL SYSTEM
F720  1    F17 WNG * 1100.0 * WAD WNG**E1 WNG
D          AVIONICS PROVISION
F721  1    F18 WNG * 1120.0 * FW WNG**E1 WNG
D          FURNISHINGS + EQUIP
C
R722  1  4  3        21 701 1
D              TOTAL ENGRG LABOR
F723  2    (722,1) * ECLR1 WNG
F723  3    (723,2) * FM WNG
F723  4    (723,2) + (723,3)
D                     DOLLAR COSTS
P
N 9
B          (9(3X,-6PF7.3))
```

```
C
C                 AEROSPACE VEHICLE AIRFRAME SYSTEM COSTS
C
C NONRECURRING DESIGN AND DEVELOPMENT COSTS
1           ===============================
2           WING HORIZVERT FUSE NAC  LDG   SUB  TOTALTOTAL
3                STAB STAB LAGE CELL GEAR SYSM HOURS  $
C
C                                                              BASIC STRUCTURE
T
C
C TOOLING
C
F731  1    TF1 WNG * 1700.0 * WW WNG**T1 WNG
F731  2    TF2 HTL * 750.0 * WH HTL**T1 HTL
F731  3    TF3 VTL * 600.0 * WV VTL**T1 VTL
F731  4    TF4 FLG * 1245.0 * WF FLG**T1 FLG
F731  5    TF5 NAC * 1240.0 * WN NAC**T1 NAC
F731  6    TF6 LDG * 600.0  * WL LDG**T1 LDG
F731  7    TF7 WNG * 500.0  * WAMP WNG** T1 WNG
F731  8    (731,1)+(731,2)+(731,3)+(731,4)+(731,5)+(731,6)+(731,7)
D       BASIC TOOL MFG D.L. HRS
F732  1    (731,1) * (2 WNG**T2 WNG - 1.)
F732  2    (731,2) * (2 HTL**T2 HTL - 1.)
F732  3    (731,3) * (2 VTL**T2 VTL - 1.)
F732  4    (731,4) * (2 FLG**T2 FLG - 1.)
F732  5    (731,5) * (2 NAC**T2 NAC - 1.)
F732  6    (731,6) * (2 LDG**T2 LDG - 1.)
F732  7    (731,7) * (2 WNG**T2 WNG - 1.)
F732  8    (732,1)+(732,2)+(732,3)+(732,4)+(732,5)+(732,6)+(732,7)
D       RATE TOOL MFG D.L. HRS
F733  1    (731,1) + (732,1)
F733  2    (731,2) + (732,2)
F733  3    (731,3) + (732,3)
F733  4    (731,4) + (732,4)
F733  4    (731,4) + (732,4)
F733  5    (731,5) + (732,5)
F733  6    (731,6) + (732,6)
F733  7    (731,7) + (732,7)
F733  8    (731,8) + (732,8)
F733  9    (733,8) * TMLR WNG
D       TOTAL TOOL MFG
F734  1    (731,1) * TEF WNG
F734  2    (731,2) * TEF HTL
F734  3    (731,3) * TEF VTL
F734  4    (731,4) * TEF FLG
F734  5    (731,5) * TEF NAC
F734  6    (731,6) * TEF LDG
F734  7    (731,7) * TEF WNG
F734  8    (734,1)+(734,2)+(734,3)+(734,4)+(734,5)+(734,6)+(734,7)
D       BASIC TOOL ENGRG D.L. HRS
F735  1    (732,1) * RTEF WNG
F735  2    (732,2) * RTEF HTL
F735  3    (732,3) * RTEF VTL
F735  4    (732,4) * RTEF FLG
F735  5    (732,5) * RTEF NAC
F735  6    (732,6) * RTEF LDG
F735  7    (732,7) * RTEF WNG
F735  8    (735,1)+(735,2)+(735,3)+(735,4)+(735,5)+(735,6)+(735,7)
D       RATE TOOL ENGRG D.L. HRS
F736  1    (734,1) + (735,1)
```

```
F736  2    (734,2) + (735,2)
F736  3    (734,3) + (735,3)
F736  4    (734,4) + (735,4)
F736  5    (734,5) + (735,5)
F736  6    (734,6) + (735,6)
F736  7    (734,7) + (735,7)
F736  8    (736,1)+(736,2)+(736,3)+(736,4)+(736,5)+(736,6)+(736,7)
F736  9    (736,8) * TFLR WNG
D     TOTAL TOOL HOURS
F737  9    (733,8) * TMF2 WNG
D     TOOL MATERIAL
F738  8    (733,8) * MAF WNG
F738  9    (738,8) * MALR WNG
D     MANUFACTURING AIDS
F739  8    (733,8) * MDF WNG
F739  9    (733,8) * MDLR WNG
D     MANUFACTURING DEVELOPMENT
F740  9    (733,9)+(736,9)+(737,9)+(738,9)+(739,9)
F740 10    Y WNG - 1974.
F740 11    1.273 * ((1.0 + RT WNG)**(740,10))
D     TOTAL TOOLING
C
F741  9    .008325 * WAMP WNG**.873 * S WNG**1.89 * CD WNG**.346 * (740,11)
D  MANUFACTURING SUPPORT
F742  8    (722,1) * QCF1 WNG + (733,8) * QCF2 WNG
F742  9    (742,8) * QCLR2 WNG
D  QUALITY CONTROL
P
N 4
B          (4(3X,-6PF7.3))
1          DRECTDRECTMATL LABOR
2          LABORLABORCOSTS+MATL
3          HOURSCOSTS      (3)
C
C                AEROSPACE VEHICLE AIRFRAME SYSTEM COSTS
C
C FIRST UNIT COSTS
T
C
C  BASIC STRUCTURE
F751  4    UF1 WNG * 1680.0 * WW WNG**.70 * (740,11) + (61,9)
D     WING
F752  4    UF2 HTL * 2200.0 * WH HTL**.65 * (740,11) + (124,9)
D     HORIZONTAL STABILIZER
F753  4    UF3 VTL * 2200.0 * WV VTL**.65 * (740,11) + (173,9)
D     VERTICAL STABILIZER
F754  4    UF4 FLG * 2000.0 * WF FLG**.70 * (740,11) + (229,9)
D     FUSELAGE
F755  4    UF5 NAC * 2100.0 * WN NAC**.66 * (740,11) + (280,9)
D     NACELLE
F756  4    UF6 LDG * 525.0 * WL LDG**.79 * (740,11) + (314,9)
D     LANDING GEAR
C
C   SUBSYSTEMS
F757  4    UF7 WNG * 1955.0 * WS WNG**.80 * (740,11)
D     SURFACE CONTROLS
F758  4    UF8 WNG * 1550.0 * WEC WNG**.71 * (740,11)
D     ENVIRONMENTAL CONTROL SYS
F759  4    UF9 WNG * 3200.0 * WHP WNG**.70 * (740,11)
D     HYDRAULICS/PNEUMATICS
F760  4    UF10 WNG * 250.0 * WE1 WNG**1.0 * (740,11)
```

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C       ELECTRICAL
F761    4     [illegible] * [illegible] * [illegible] WNG**.7[illegible] * (740,11)
C       [illegible]
F762    4     [illegible] * [illegible] * WAM WT,**.77 * (740,11)
C       [illegible]
F763    4     [illegible] * [illegible] * [illegible] WNG**.70 * (740,11)
C       [illegible]
F764    4     [illegible] * [illegible] * [illegible] WNG**.85 * (740,11)
C       [illegible]
F765    4     [illegible] * [illegible] * [illegible] WNG**.45 * (740,11)
C       [illegible]
F766    4     [illegible] * [illegible] * [illegible] WNG**. [illegible] * (740,11)
C       AVIONICS [illegible]
F767    4     [illegible] * [illegible] * [illegible] WNG**.75 * (740,11)
C       [illegible]
F768    4     ([illegible],4)+([illegible],4)+([illegible],4)+(75[illegible],4)+(761,4)+(762,4)+(763,4)+(764,4)
F769    4     (765,4)+([illegible],4)+([illegible],4)+(767,4)
C             [illegible] SYSTEM [illegible]
F770    4     ([illegible],4)+([illegible],4)+(75[illegible],4)+(754,4)+(755,4)+(756,4)+(76[illegible],4)
C             TOTAL [illegible] COST
C
[illegible]
3             ([illegible])
1
2             HOURS   %   HOURS   %   HOURS   %
3
C
C                       AIRFRAME  VEHICLE  AIRFRAME SYSTEM COSTS
C
C RECURRING AIRFRAME PRODUCTION COSTS
C
C                                                    RDT+E               QUAN                QUAN
F780    1     QN1 WNG * 1.0
F780    3     QN3 WNG * 1.0
F780    5     QN5 WNG * 1.0
C
3             (F([illegible],-30F7.[illegible]))
T
N 4
              [illegible] WAS CHANGED BECAUSE THE LAST PRODUCTION QUANTITY WAS NOT USED
              [illegible] WOULD NORMALLY BE DEFINED AT SIX (6)
C
F781    1     (72[illegible],1) * ([illegible] WNG**ES WNG - 1.0)
F781    2     (781,1) * [illegible] WNG
F781    3     (72[illegible],1) * (QN4 WNG**ES WNG - QN2 WNG**ES WNG)
F781    4     (781,3) * [illegible] WNG
F781    5     (72[illegible],1) * (QN6 WNG**ES WNG - QN2 WNG**ES WNG)
F781    6     (781,5) * [illegible] WNG
C       SUSTAINING, [illegible]
F782    1     ((7[illegible],4) + (7[illegible],8)) * (QN2 WNG**TU WNG - 1.0)
F782    2     (782,1) * [illegible] WNG
F782    3     ((7[illegible],8) + (7[illegible],8)) * (QN4 WNG**TU WNG - QN2 WNG**TU WNG)
F782    4     (782,3) * [illegible] WNG
F782    5     ((7[illegible],8) + (77[illegible],8)) * (QN6 WNG**TU WNG - QN2 WNG**TU WNG)
F782    6     (782,5) * [illegible] WNG
C       SUSTAINING TOOLING
C       MANUFACTURING
7783    2 29 751  4       QN1 WNG    QN2 WNG   QC11 WNG
7783    4 29 751  4       QN2 WNG    QN4 WNG   QC21 WNG
7783    6 29 751  4       QN2 WNG    QN6 WNG   QC31 WNG
C             [illegible]
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7784  2 29 752  4     0N1 HTL    0N2 HTL   0C12 HTL
7784  4 29 752  4     0N2 HTL    0N4 HTL   0C22 HTL
7784  6 29 752  4     0N2 HTL    0N6 HTL   0C32 HTL
0         HORIZONTAL STABILIZER
7785  2 29 753  4     0N1 VTL    0N2 VTL   0C13 VTL
7785  4 29 753  4     0N2 VTL    0N4 VTL   0C23 VTL
7785  6 29 753  4     0N2 VTL    0N6 VTL   0C33 VTL
0         VERTICAL STABILIZER
7786  2 29 754  4     0N1 FLG    0N2 FLG   0C14 FLG
7786  4 29 754  4     0N2 FLG    0N4 FLG   0C24 FLG
7786  6 29 754  4     0N2 FLG    0N6 FLG   0C34 FLG
0         FUSELAGE
7787  2 29 755  4     0N1 NAC    0N2 NAC   0C15 NAC
7787  4 29 755  4     0N2 NAC    0N4 NAC   0C25 NAC
7787  6 29 755  4     0N2 NAC    0N6 NAC   0C35 NAC
0         NACELLE
7788  2 29 756  4     0N1 LDG    0N2 LDG   0C16 LDG
7788  4 29 756  4     0N2 LDG    0N4 LDG   0C26 LDG
7788  6 29 756  4     0N2 LDG    0N6 LDG   0C36 LDG
0         LANDING GEAR
7789  2 29 757  4     0N1 WNG    0N2 WNG   0C17 WNG
7789  4 29 757  4     0N2 WNG    0N4 WNG   0C27 WNG
7789  6 29 757  4     0N2 WNG    0N6 WNG   0C37 WNG
0         SURFACE CONTROLS
7790  2 29 758  4     0N1 WNG    0N2 WNG   0C17 WNG
7790  4 29 758  4     0N2 WNG    0N4 WNG   0C27 WNG
7790  6 29 758  4     0N2 WNG    0N6 WNG   0C37 WNG
0         ENVIRONMENTAL CONTROL SYS
7791  2 29 759  4     0N1 WNG    0N2 WNG   0C17 WNG
7791  4 29 759  4     0N2 WNG    0N4 WNG   0C27 WNG
7791  6 29 759  4     0N2 WNG    0N6 WNG   0C37 WNG
0         HYDRAULICS/PNEUMATICS
7792  2 29 760  4     0N1 WNG    0N2 WNG   0C17 WNG
7792  4 29 760  4     0N2 WNG    0N4 WNG   0C27 WNG
7792  6 29 760  4     0N2 WNG    0N6 WNG   0C37 WNG
0         ELECTRICAL
7793  2 29 761  4     0N1 WNG    0N2 WNG   0C17 WNG
7793  4 29 761  4     0N2 WNG    0N4 WNG   0C27 WNG
7793  6 29 761  4     0N2 WNG    0N6 WNG   0C37 WNG
0         INSTRUMENTS
7794  2 29 762  4     0N1 WNG    0N2 WNG   0C17 WNG
7794  4 29 762  4     0N2 WNG    0N4 WNG   0C27 WNG
7794  6 29 762  4     0N2 WNG    0N6 WNG   0C37 WNG
0         AUXILIARY POWER UNIT
7795  2 29 763  4     0N1 WNG    0N2 WNG   0C17 WNG
7795  4 29 763  4     0N2 WNG    0N4 WNG   0C27 WNG
7795  6 29 763  4     0N2 WNG    0N6 WNG   0C37 WNG
0         ARMAMENT PROVISIONS
7796  2 29 764  4     0N1 WNG    0N2 WNG   0C17 WNG
7796  4 29 764  4     0N2 WNG    0N4 WNG   0C27 WNG
7796  6 29 764  4     0N2 WNG    0N6 WNG   0C37 WNG
0         ENGINE ASSOCIATED EQUIP
7797  2 29 765  4     0N1 WNG    0N2 WNG   0C17 WNG
7797  4 29 765  4     0N2 WNG    0N4 WNG   0C27 WNG
7797  6 29 765  4     0N2 WNG    0N6 WNG   0C37 WNG
0         FUEL SYSTEM
7798  2 29 766  4     0N1 WNG    0N2 WNG   0C17 WNG
7798  4 29 766  4     0N2 WNG    0N4 WNG   0C27 WNG
7798  6 29 766  4     0N2 WNG    0N6 WNG   0C37 WNG
0         AVIONICS PROVISION
7799  2 29 767  4     0N1 WNG    0N2 WNG   0C17 WNG
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2799   4  29  767   4        0N2  WNG    0N4  WNG   0C27  WNG
2799   6  29  767   4        0N2  WNG    0N6  WNG   0C37  WNG
D              FURNISHINGS + EQUIP
3900   1   6   3          17  793  1
D       TOTAL  MANUFACTURING
L
E
```

C. SAV MATRIX, B-58 TEST CASE

This section of Appendix K contains the printout of the SAV matrix resulting from the B-58 test case.

SSV MATRIX

701	3.05E+05	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
702	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
703	[illegible]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
704	[illegible]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
705	[illegible]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
706	[illegible]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
707	[illegible]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
711	[illegible]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
712	1.37E+06	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
713	[illegible]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
714	[illegible]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
715	[illegible]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
716	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
717	[illegible]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
718	[illegible]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
719	1.14E+05	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
720	[illegible]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
721	1.3[illegible]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
722	[illegible]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
723	0.	[illegible]	[illegible]	7.69E+07	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
731	[illegible]	0.	[illegible]	1.27E+04	1.40E+06	2.94E+05	[illegible]	[illegible]	0.	0.	0.	0.	[illegible]
732	[illegible]	0.	[illegible]	[illegible]	[illegible]	4.38E+04	5.00E+05	1.77E+06	0.	0.	0.	0.	[illegible]
733	[illegible]	0.	[illegible]	[illegible]	1.67E+06	3.40E+05	3.80E+06	[illegible]	7.01E+07	0.	0.	0.	[illegible]
734	[illegible]	0.	7.44E+04	5.07E+05	5.61E+05	1.17E+05	1.00E+05	[illegible]	0.	0.	0.	0.	[illegible]
735	7.51E+04	0.	4.67E+03	3.16E+04	7.57E+04	7.32E+03	7.49E+04	[illegible]	0.	0.	0.	0.	[illegible]
736	1.28E+06	0.	7.33E+04	5.37E+03	5.96E+05	1.25E+05	1.28E+06	3.39E+06	[illegible]	0.	0.	0.	[illegible]
737	0.	0.	0.	0.	0.	0.	0.	0.	2.14E+07	0.	0.	0.	[illegible]
738	0.	0.	0.	0.	0.	0.	0.	1.60E+06	1.11E+07	0.	0.	0.	[illegible]
739	0.	0.	0.	0.	0.	0.	0.	1.80E+06	[illegible]	0.	0.	0.	[illegible]
740	0.	0.	0.	0.	0.	0.	0.	0.	1.37E+08	[illegible]	[illegible]	0.	[illegible]
741	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]	0.	0.	0.	[illegible]
742	0.	0.	0.	0.	0.	0.	0.	[illegible]	[illegible]	0.	0.	0.	[illegible]
751	0.	0.	0.	5.19E+05	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
752	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
753	0.	0.	0.	5.79E+05	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
754	0.	0.	0.	5.99E+05	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
755	0.	0.	0.	1.41E+06	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
756	0.	0.	0.	6.83E+05	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
757	0.	0.	0.	2.45E+05	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
758	0.	0.	0.	8.06E+05	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
759	0.	0.	0.	3.09E+05	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
760	0.	0.	0.	3.59E+05	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
761	0.	0.	0.	1.03E+06	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
762	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
763	0.	0.	0.	1.36E+05	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
764	0.	0.	0.	2.58E+05	0.	0.	0.	0.	0.	0.	0.	0.	2.58E+05
765	0.	0.	0.	7.92E+05	0.	0.	0.	0.	0.	0.	0.	0.	7.92E+05
766	0.	0.	0.	3.68E+05	0.	0.	0.	0.	0.	0.	0.	0.	3.68E+05
767	0.	0.	0.	6.57E+05	0.	0.	0.	0.	0.	0.	0.	0.	6.57E+05
768	0.	0.	0.	[illegible]	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
769	0.	0.	0.	7.73E+06	0.	0.	0.	0.	0.	0.	0.	0.	7.73E+06
770	0.	0.	0.	2.26E+07	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
780	3.00E+01	0.	3.60E+01	0.	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
781	4.57E+06	3.00E+07	2.88E+05	1.93E+07	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]
782	3.39E+06	5.34E+07	4.89E+05	2.94E+07	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]

783	0.	8.30E+07	0.	1.20E+09	0.	1.83E+06	0.	0.	0.	0.	0.	0.	2.00E+08
784	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
785	0.	7.39E+06	0.	1.10E+07	0.	1.69E+05	0.	0.	0.	0.	0.	0.	1.84E+07
786	0.	7.75E+07	0.	1.16E+09	0.	1.77E+06	0.	0.	0.	0.	0.	0.	1.93E+08
787	0.	1.83E+07	0.	2.73E+07	0.	4.17E+05	0.	0.	0.	0.	0.	0.	4.55E+07
788	0.	9.57E+06	0.	1.54E+07	0.	2.29E+05	0.	0.	0.	0.	0.	0.	2.43E+07
789	0.	3.97E+07	0.	5.93E+07	0.	9.93E+05	0.	0.	0.	0.	0.	0.	1.09E+08
790	0.	1.27E+07	0.	2.27E+07	0.	3.23E+05	0.	0.	0.	0.	0.	0.	3.54E+07
791	0.	4.89E+06	0.	8.69E+06	0.	1.24E+05	0.	0.	0.	0.	0.	0.	1.36E+07
792	0.	1.44E+07	0.	2.55E+07	0.	3.64E+05	0.	0.	0.	0.	0.	0.	3.44E+07
793	0.	1.63E+07	0.	2.91E+07	0.	4.14E+05	0.	0.	0.	0.	0.	0.	4.54E+07
794	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
795	0.	3.09E+06	0.	5.50E+06	0.	7.84E+04	0.	0.	0.	0.	0.	0.	8.59E+06
796	0.	4.09E+06	0.	7.25E+06	0.	1.03E+05	0.	0.	0.	0.	0.	0.	1.13E+07
797	0.	1.27E+07	0.	2.27E+07	0.	3.17E+05	0.	0.	0.	0.	0.	0.	3.47E+07
798	0.	5.81E+06	0.	1.07E+07	0.	1.47E+05	0.	0.	0.	0.	0.	0.	1.61E+07
799	0.	1.04E+07	0.	1.85E+07	0.	2.63E+05	0.	0.	0.	0.	0.	0.	2.89E+07
800	0.	3.16E+08	0.	5.03E+08	0.	7.53E+06	0.	0.	0.	0.	0.	0.	9.27E+08

D. NAMELIST VARIABLES DICTIONARY

This section of Appendix K consists of a definition of the NAMELIST variables used in the system cost estimating method. This list of variables corresponds to the printout of input elements given in the first section. Inputs are derived from Section 3.3. This list can also serve as an input table and is coded to show input source.

SYMBOL	DESCRIPTION	INPUT VALUE	INPUT SOURCE
WW	The weight of the wing structure in pounds		Wt. Statement
WH	The weight of the horizontal stabilizer in pounds		
WV	The weight of the vertical stabilizer in pounds		
WF	The weight of the fuselage in pounds		
WN	The weight of the nacelles in pounds		
WL	The weight of the landing gear in pounds		
E1	Cost weight scaling exponent	0.6	Fig. I-1.
E2	Cost weight scaling exponent	0.6	Fig. L-1
F1	Complexity factor - wing		Fig. I-1
F2	- horizontal stabilizer		Fig. I-2
F3	- vertical stabilizer		Fig. I-3
F4	- fuselage		Fig. I-4
F5	- nacelles		Fig. I-5
F6	- landing gear		Fig. I-6
F7	- configuration design engrg.		Fig. L-1
F8	- surface controls		Fig. L-2
F9	- environmental control system		Fig. L-3
F10	- hydraulics/pneumatics		Fig. L-4
F11	- electrical		Fig. L-5
F12	- instruments		Fig. L-6
F13	- auxiliary power unit		Fig. L-7
F14	- armament provisions		Fig. L-8
F15	- engine associated equipment		Fig. L-9
F16	- fuel system		Fig. L-10
F17	- avionics provision		Fig. L-11
F18	- furnishings and equipment		Fig. L-12
WAMP	AMPR weight of basic structure		Wt. Statement
WS	Weight of surface controls		
WEC	Weight of environmental control system		

SYMBOL	DESCRIPTION	INPUT VALUE	INPUT SOURCE
WHP	Weight of hydraulics/pneumatics		Wt. statement
WE1	Weight of electrical subsystem		
WI	Weight of instruments		
WAP	Weight of auxiliary power unit		
WA	Weight of armament provisions		
WEA	Weight of engine associated equipment		
WFS	Weight of fuel system		
WAD	Weight of avionics provision		
FW	Weight of furnishings and equipment		
ECLR1	Composite engineering labor rate		Estimated
FM	Percentage factor for engineering material cost	0.2	-
T1	Cost-weight scaling exponent	0.75	Fig. I-7, I-11
TF1	Complexity factor for tooling-wing		*Table 40
TF2	Complexity factor for tooling - horizontal stabilizer		
TF3	Complexity factor for tooling - vertical stabilizer		
TF4	Complexity factor for tooling - fuselage		
TF5	Complexity factor for tooling - nacelles		
TF6	Not used - tooling for Landing Gear is minimal	-	-
TF7	Complexity factor for tooling - functional subsystems	-	Fig. L-13
R	Production rate		Program data
TR	Scaling with production rate increase	0.3	-
TMLR	Tool manufacturing labor rate		Estimated
TEF	Ratio of tool engineering to tool manufacturing		Table I-2
RTEF	Rate tool engineering factor	0.15	-
TELR	Tool engineering labor rate		Estimated
TMF2	Ratio of tooling material to tool manufacturing	2.0	-

*Input value, defined as complexity only as opposed to TMF given in Table 40, is taken from column headed complexity.

SYMBOL	DESCRIPTION	INPUT VALUE	INPUT SOURCE
MAF	Manufacturing aids factor	0.12	-
MALR	Manufacturing aids labor rate		Estimated
MDF	Manufacturing development factor	0.15	-
MDLR	Manufacturing development labor rate		Estimated
S	Maximum speed at best altitude (kts)		Design data
QD	Development quantity		Program data
RI	Rate of inflation		Estimated
Y	Year of estimate subsequent to 1974	1974 <	-
QCF1	Ratio of Q/C start-up cost to engineering labor	0.01	-
QCF2	Ratio of Q/C start-up cost to tool manufacturing labor	0.06	-
QCLR2	Quality Control labor rate		Estimated
W	Not used		
UF1	Complexity factor - wing		Fig. L-14
UF2	- horizontal stabilizer		Fig. L-15
UF3	- vertical stabilizer		Fig. L-16
UF4	- fuselage		Fig. L-17
UF5	- nacelles		Fig. L-18
UF6	- landing gear		Fig. L-19
UF7	- surface controls		Fig. L-20
UF8	- environmental control system		Fig. L-21
UF9	- hydraulics/pneumatics		Fig. L-22
UF10	- electrical		Fig. L-23
UF11	- instruments		Fig. L-24
UF12	- auxiliary power unit		Fig. L-25
UF13	- armament provisions		Fig. L-26
UF14	- engine associated equipment		Fig. L-27
UF15	- fuel system		Fig. L-28
UF16	- avionics provisions		Fig. L-29
UF17	- furnishings and equipment		Fig. L-30

SYMBOL	DESCRIPTION	INPUT VALUE	INPUT SOURCE
QN1	Quantity estimated, unit No. 1		Program Data
QN2	Quantity estimated, RDT&E units		Program Data
QN3	Quantity estimated, production quantity 1		Program Data
QN4	QN4 = QN2 + QN3		
QN5	Quantity estimated, production quantity 2		Program Data
QN6	QN6 = QN2 + QN5		
ES	Sustaining engineering scaling with quantity	.2	-
ECLR2	Engineering composite labor rate	ECLR1	-
TU	Sustaining tooling scaling with quantity	.14	-
TMEC	Tool manufacturing and engineering cost		Estimated
QC11	Learning factor - wing - RDT&E units	(Decimal Fraction)	Not determined
QC21	Learning factor - wing - Qty 1		
QC31	Learning factor - wing - Qty 2		
QC12	Learning factor - horizontal - RDT&E units		
QC22	Learning factor - horizontal - Qty 1		
QC32	Learning factor - horizontal - Qty 2		
QC13	Learning factor - vertical - RDT&E units		
QC23	Learning factor - vertical - Qty 1		
QC33	Learning factor - vertical - Qty 2		
QC14	Learning factor - fuselage - RDT&E units		
QC24	Learning factor - fuselage - Qty 1		
QC34	Learning factor - fuselage - Qty 2		
QC15	Learning factor - nacelles - RDT&E units		
QC25	Learning factor - nacelles - Qty 1		
QC35	Learning factor - nacelles - Qty 2		
QC16	Learning factor - landing gear - RDT&E units		
QC26	Learning factor - landing gear - Qty 1		
QC36	Learning factor - landing gear - Qty 2		
QC17	Learning factor - subsystems - RDT&E units		
QC27	Learning factor - subsystems - Qty 1		
QC37	Learning factor - subsystems - Qty 2		

E. SUMMARY OF F-CARD VARIABLES

This summary provides a track of model card coefficients from the model card listing to the relevant CER equation, with back-up data reference, for the system cost estimating method.

MODEL CARD	DESCRIPTION	EQUATION NO.	REFERENCE
Nonrecurring Design and Development Costs			
F701 1	Estimating coefficient, EC	(1)	Fig. I-1
F702 1		(1)	Fig. I-2
F703 1		(1)	Fig. I-3
F704 1		(1)	Fig. I-4
F705 1		(1)	Fig. I-5
F706 1		(1)	Fig. I-6
F707 1		(2)	Fig. L-1
F711 1		(3)	Fig. L-2
F712 1		(3)	Fig. L-3
F713 1		(3)	Fig. L-4
F714 1		(3)	Fig. L-5
F715 1		(3)	Fig. L-6
F716 1		(3)	Fig. L-7
F717 1		(3)	Fig. L-8
F718 1		(3)	Fig. L-9
F719 1		(3)	Fig. L-10
F720 1		(3)	Fig. L-11
F721 1		(3)	Fig. L-12
F731 1		(8)	Fig. I-7
F731 2		(8)	Fig. I-8
F731 3		(8)	Fig. I-9
F731 4		(8)	Fig. I-10
F731 5		(8)	Fig. I-11
F731 6		(8)	NA
F731 7		(8)	Fig. L-13
F740 11	Inflation factor, 1970 to 1974: 1.273	(15)	-
F741 9	See equation (15)	-	-
First Unit Costs			
F751 4	See equation (17)	-	Fig. L-14
F752 4	See equation (17)	-	Fig. L-15
F753 4	See equation (17)	-	Fig. L-16
F754 4	See equation (17)	-	Fig. L-17
F755 4	See equation (17)	-	Fig. L-18
F756 4	See equation (17)	-	Fig. L-19

MODEL CARD	DESCRIPTION	EQUATION NO.	REFERENCE
First Unit Costs (Continued)			
F757 4	See equation (17	-	Fig. L-20
F758 4		-	Fig. L-21
F759 4		-	Fig. L-22
F760 4		-	Fig. L-23
F761 4		-	Fig. L-24
F762 4		-	Fig. L-25
F763 4		-	Fig. L-26
F764 4		-	Fig. L-27
F765 4		-	Fig. L-28
F766 4		-	Fig. L-29
F767 4		-	Fig. L-30

APPENDIX L

SYSTEM COST ESTIMATING METHOD BACK-UP DATA

This appendix provides charts containing back-up data for the estimating coefficients used in estimating airframe system costs. These data make up a partial set inasmuch as those items common to both methods have been included in Appendix I.

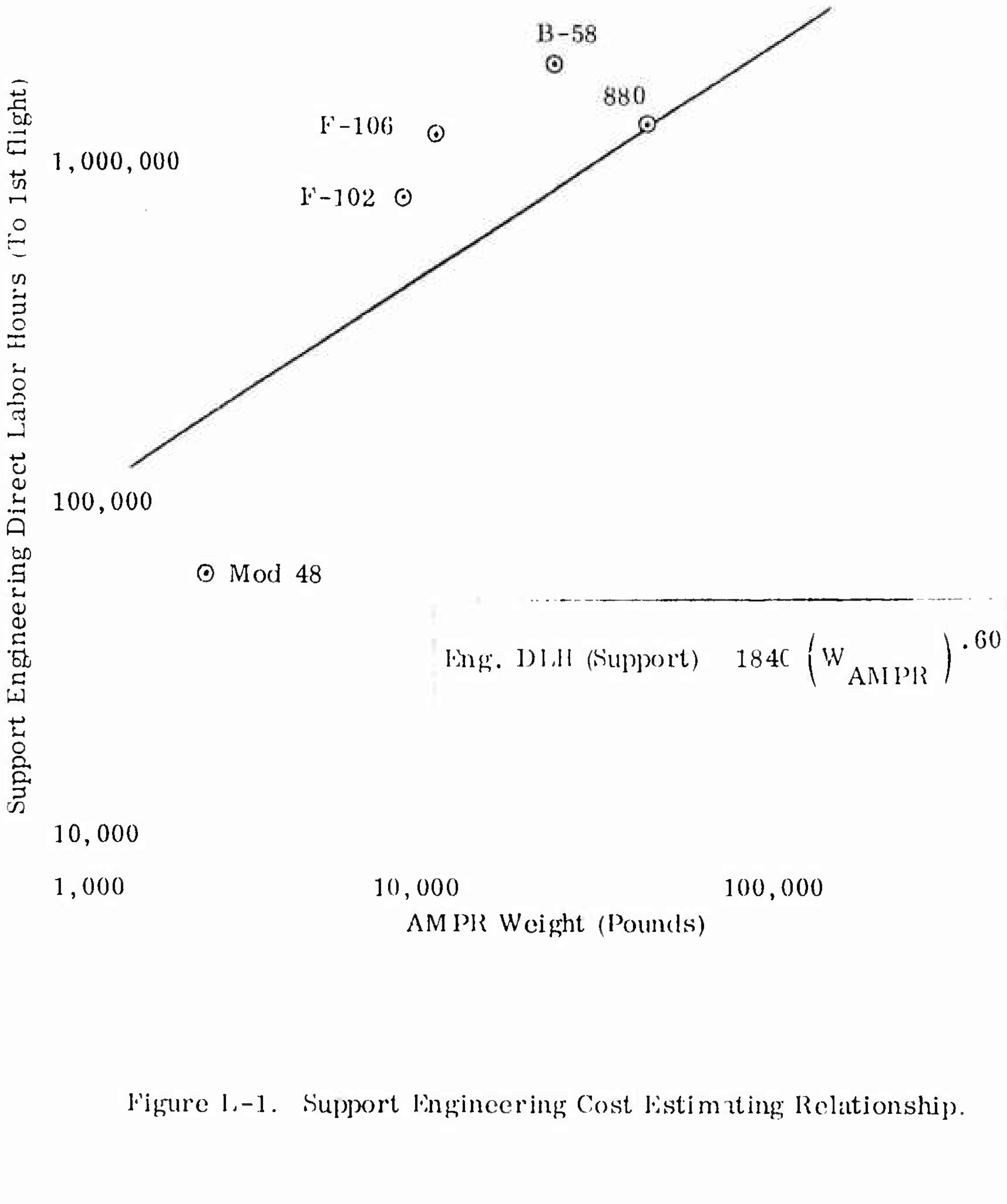


Figure L-1. Support Engineering Cost Estimating Relationship.

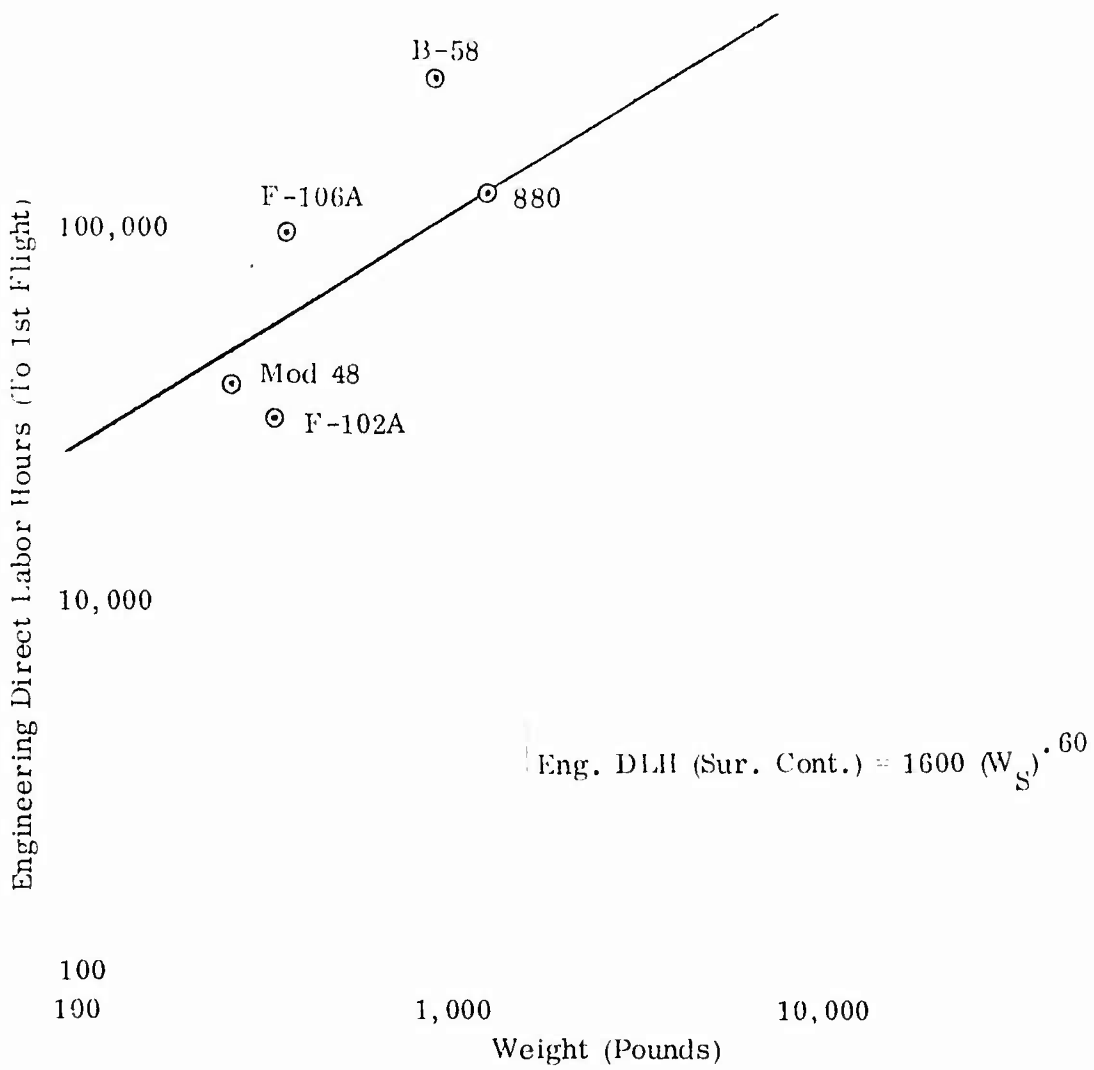


Figure L-2. Surface Controls Cost Estimating Relationship.

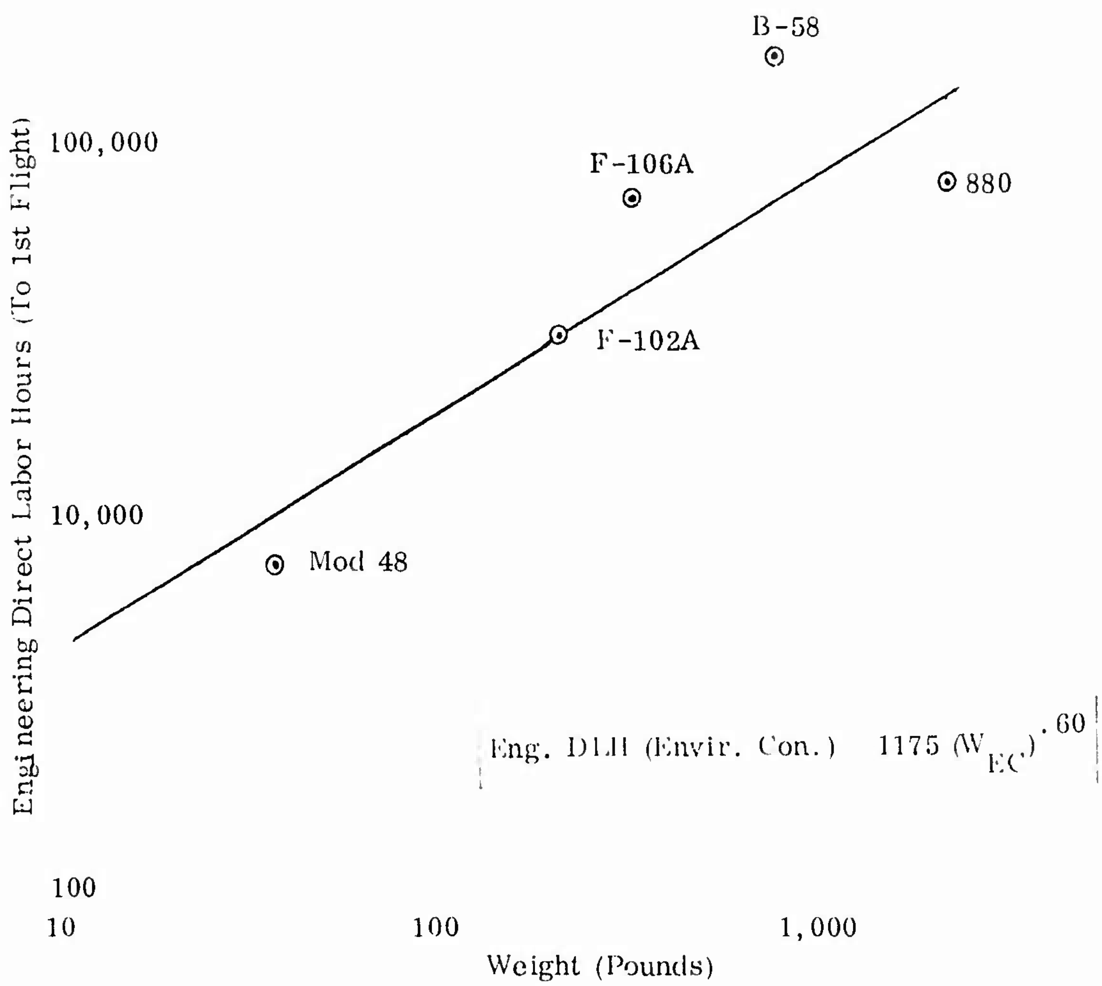


Figure L-3. Environmental Control Cost Estimating Relationship.

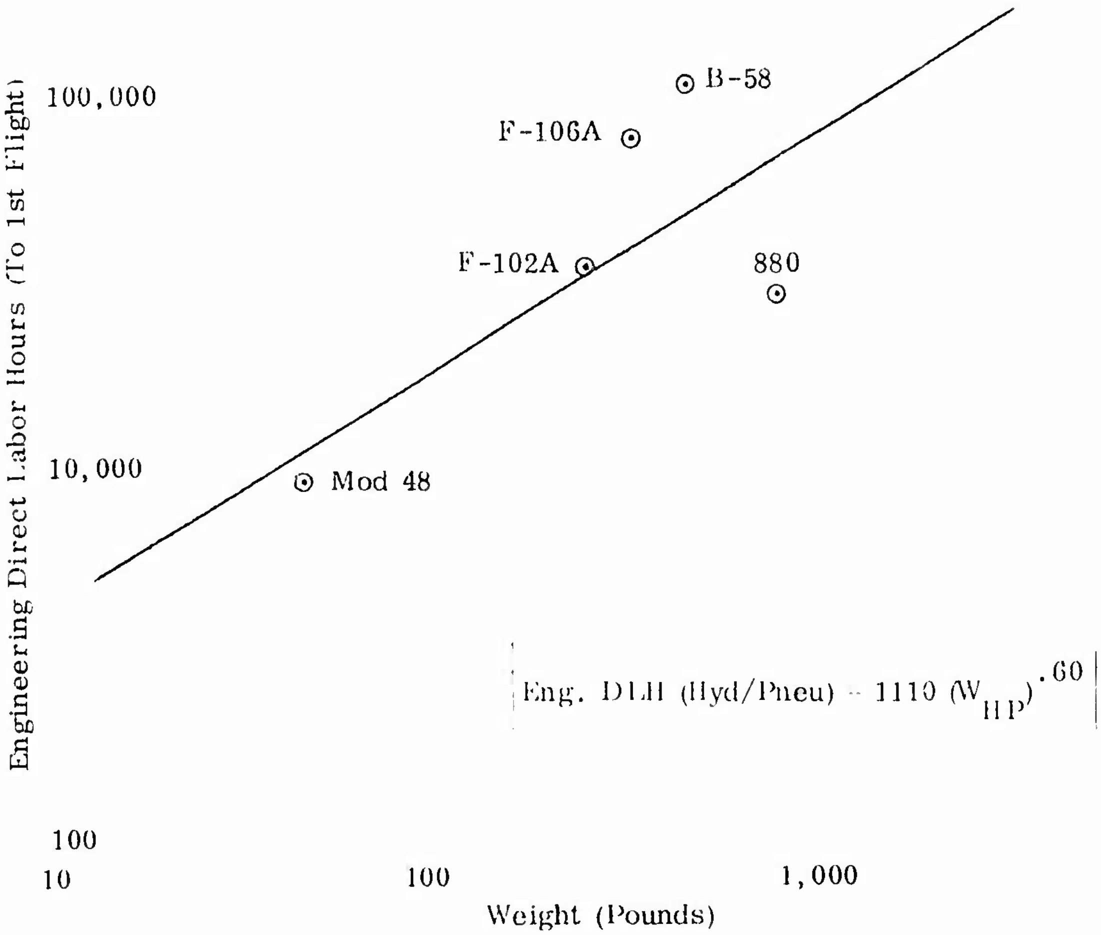


Figure L-4. Hydraulics/Pneumatics Cost Estimating Relationship.

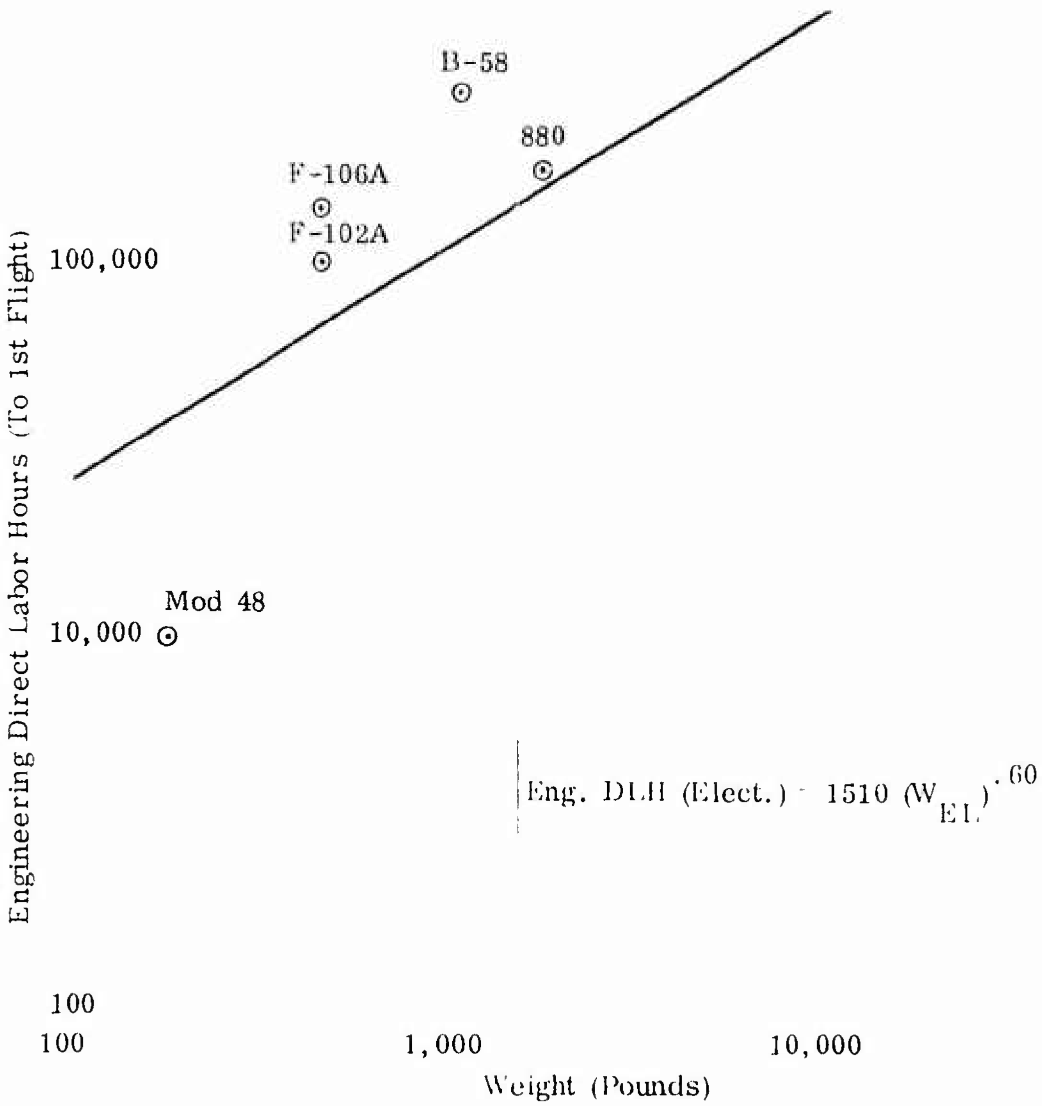


Figure L-5. Electrical Cost Estimating Relationship.

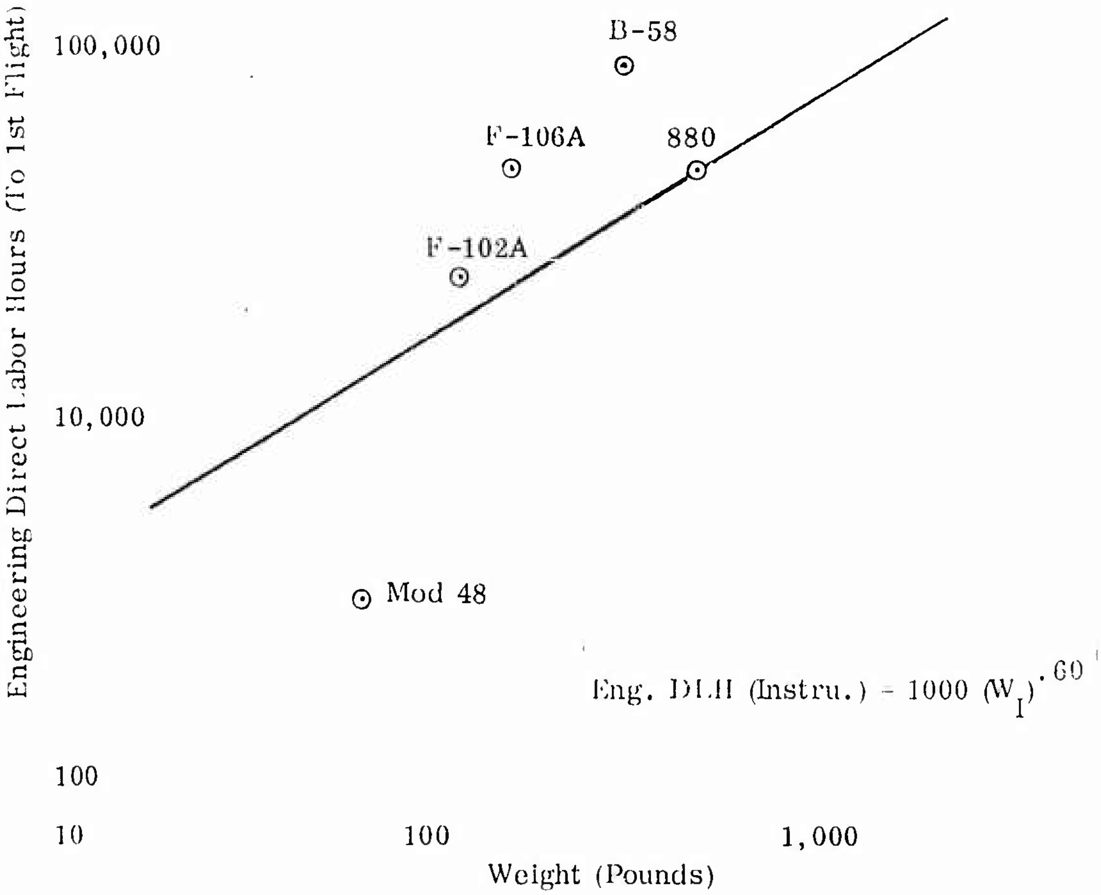


Figure L-6. Instruments Cost Estimating Relationship.

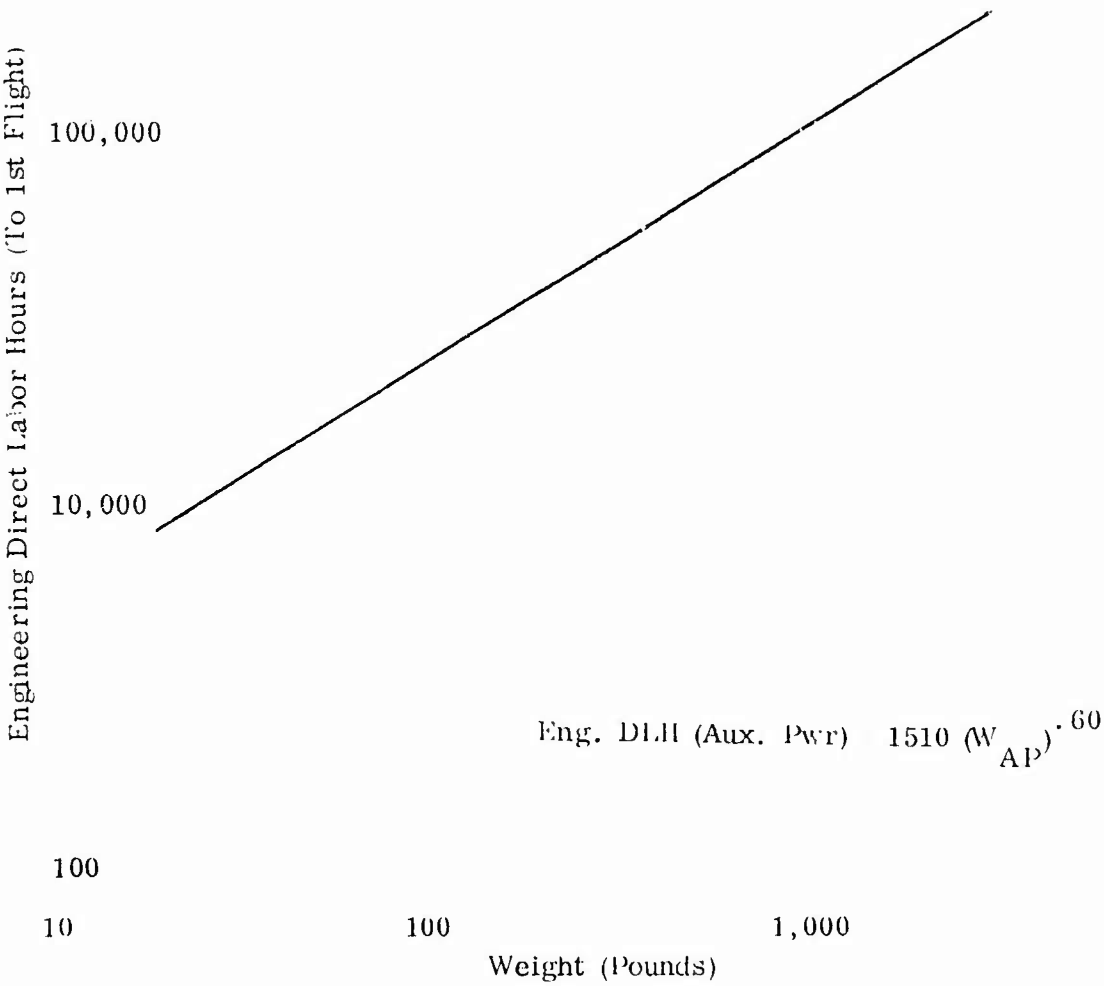


Figure L-7. Auxiliary Power Cost Estimating Relationship.

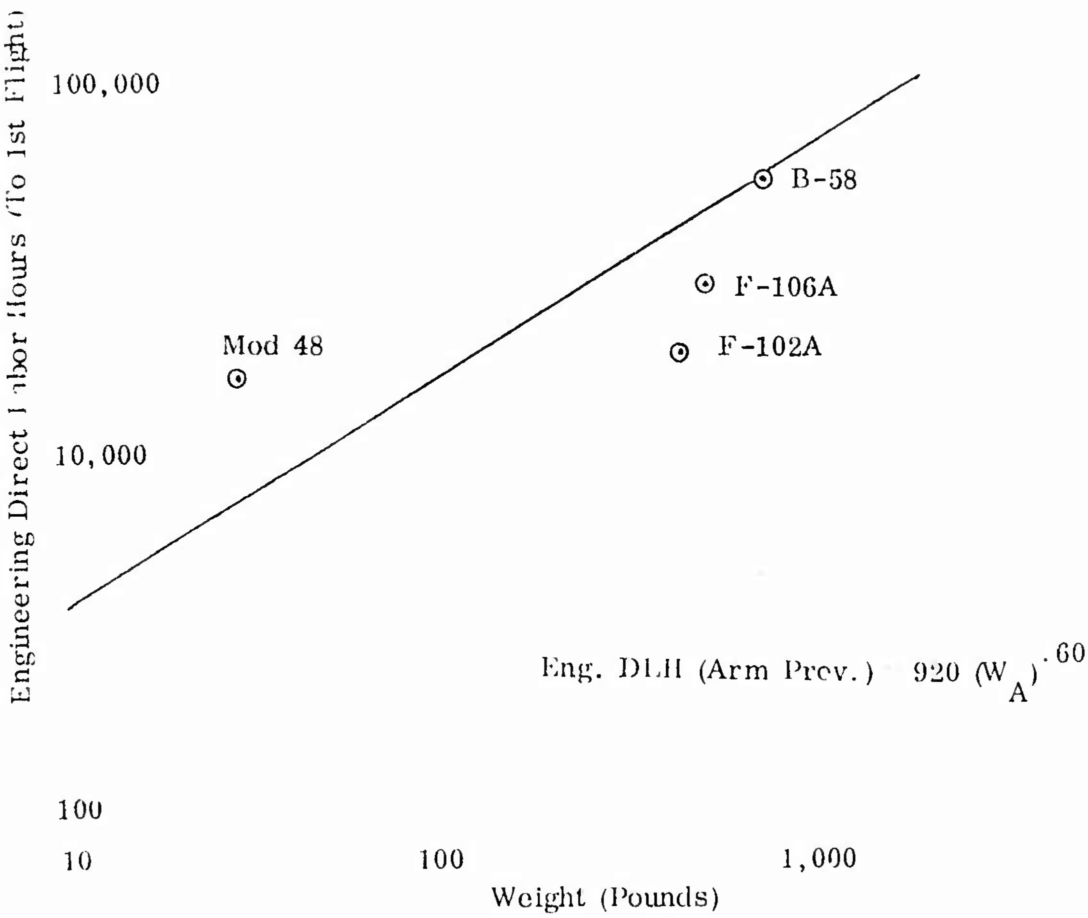


Figure L-8. Armament Provisions Cost Estimating Relationship.

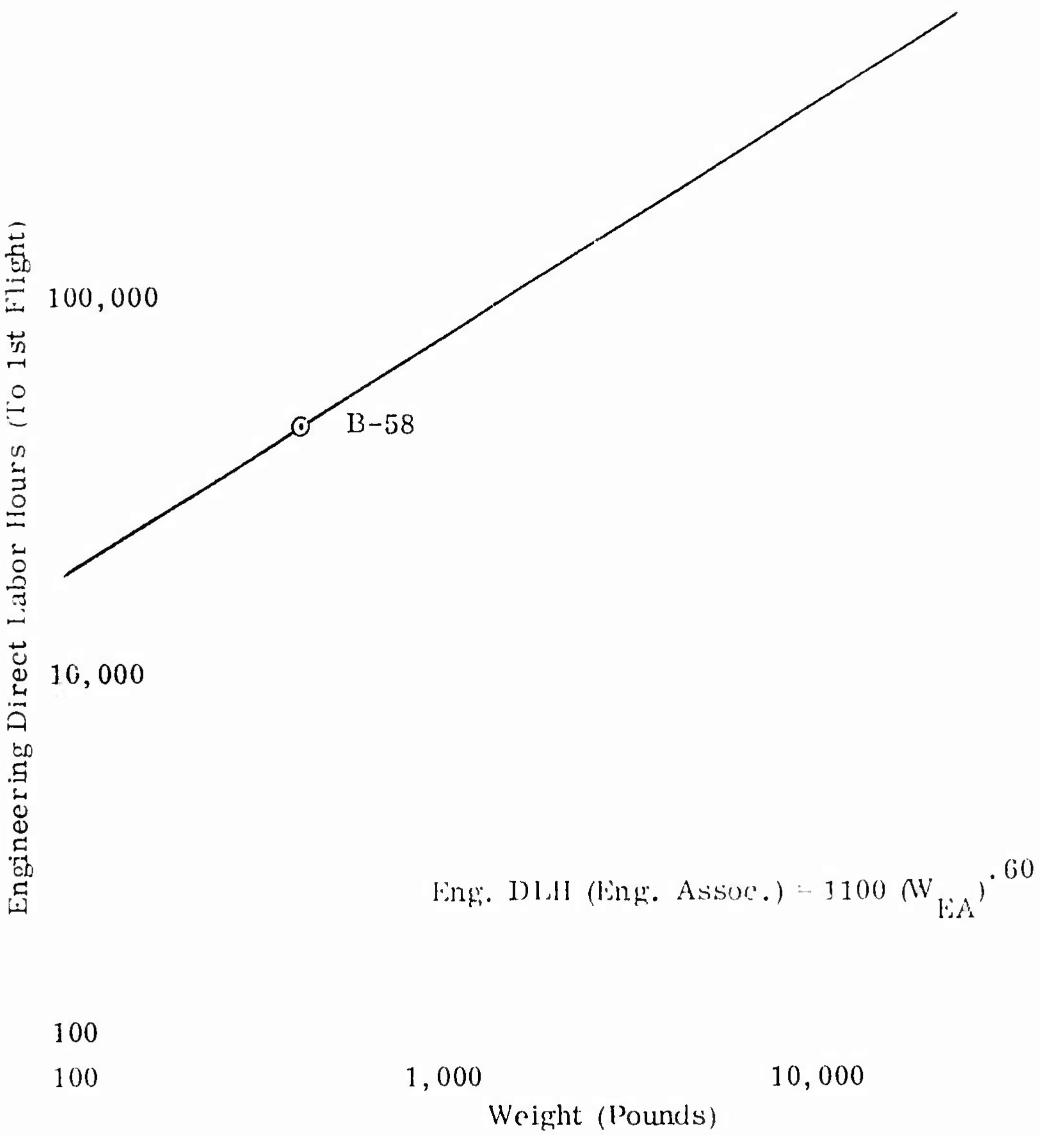


Figure L-9. Engine Associated Equipment Cost Estimating Relationship.

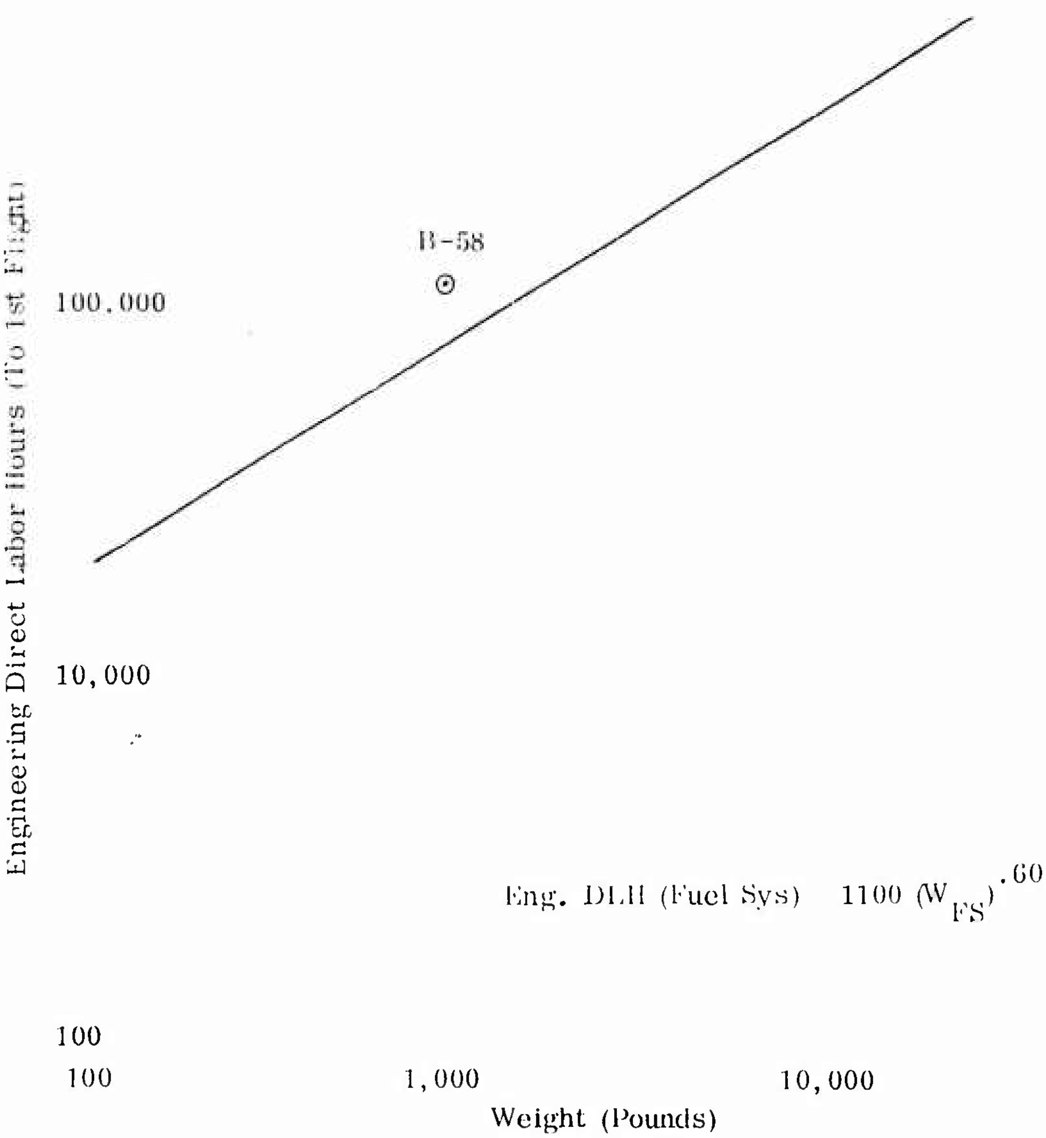


Figure L-10. Fuel System Cost Estimating Relationship.

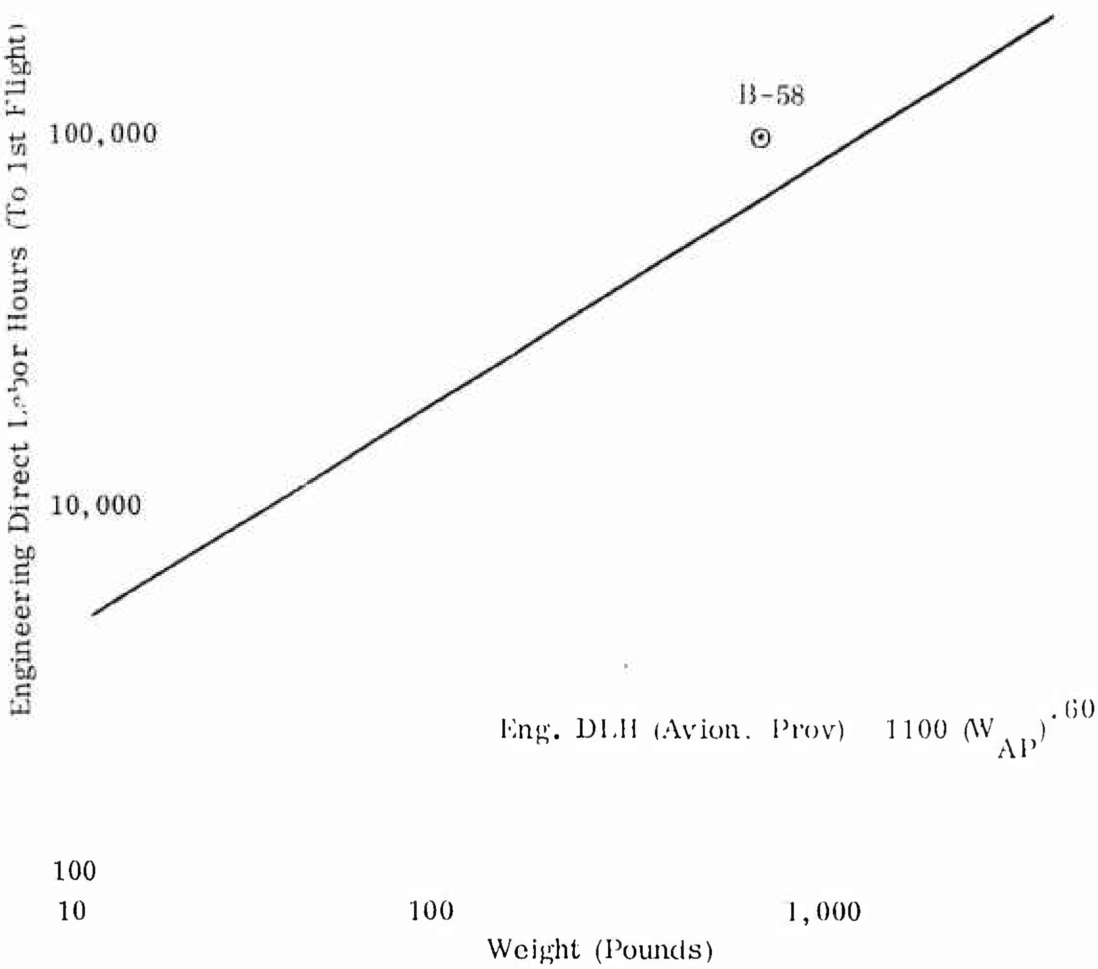


Figure L-11. Avionics Provisions Cost Estimating Relationship.

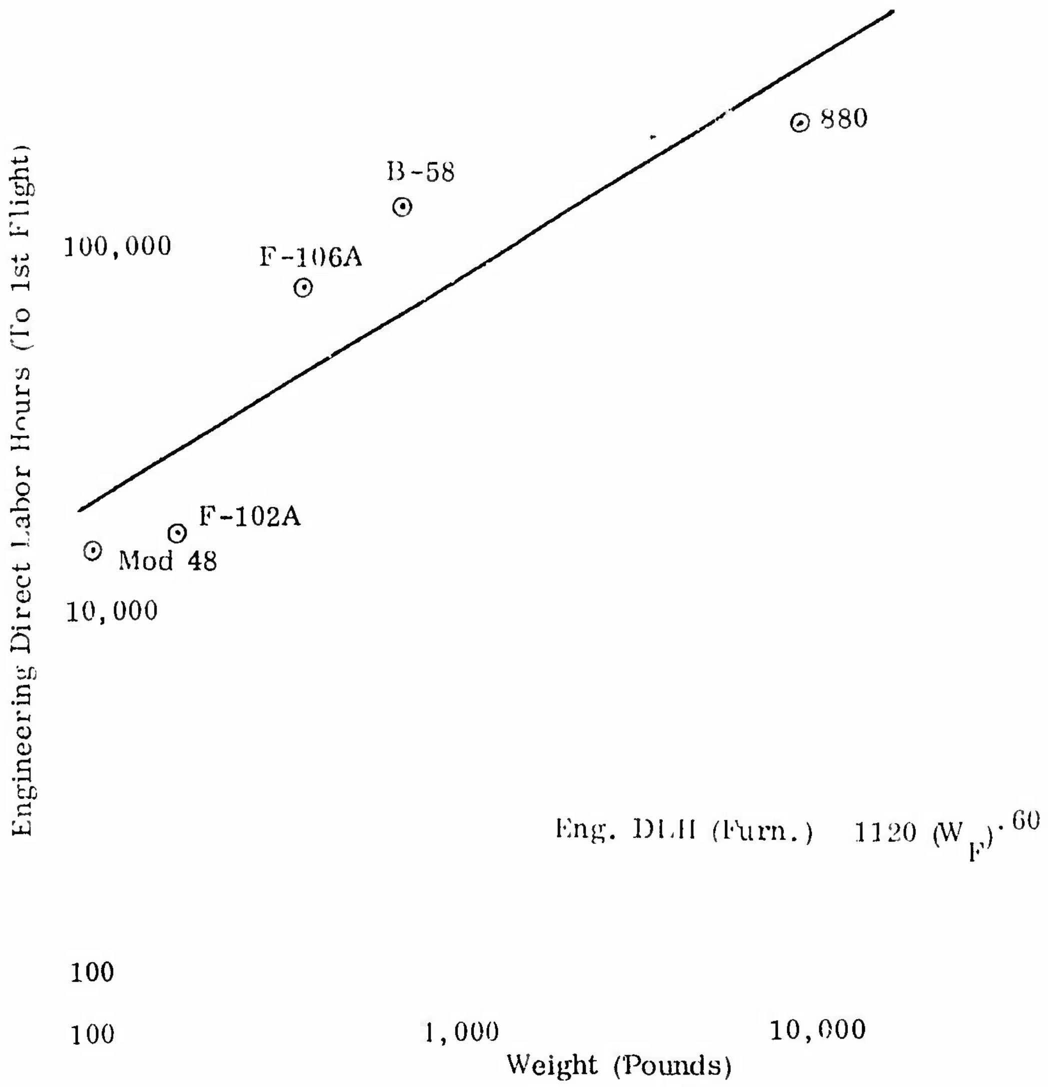


Figure L-12. Furnishings and Equipment Cost Estimating Relationship.

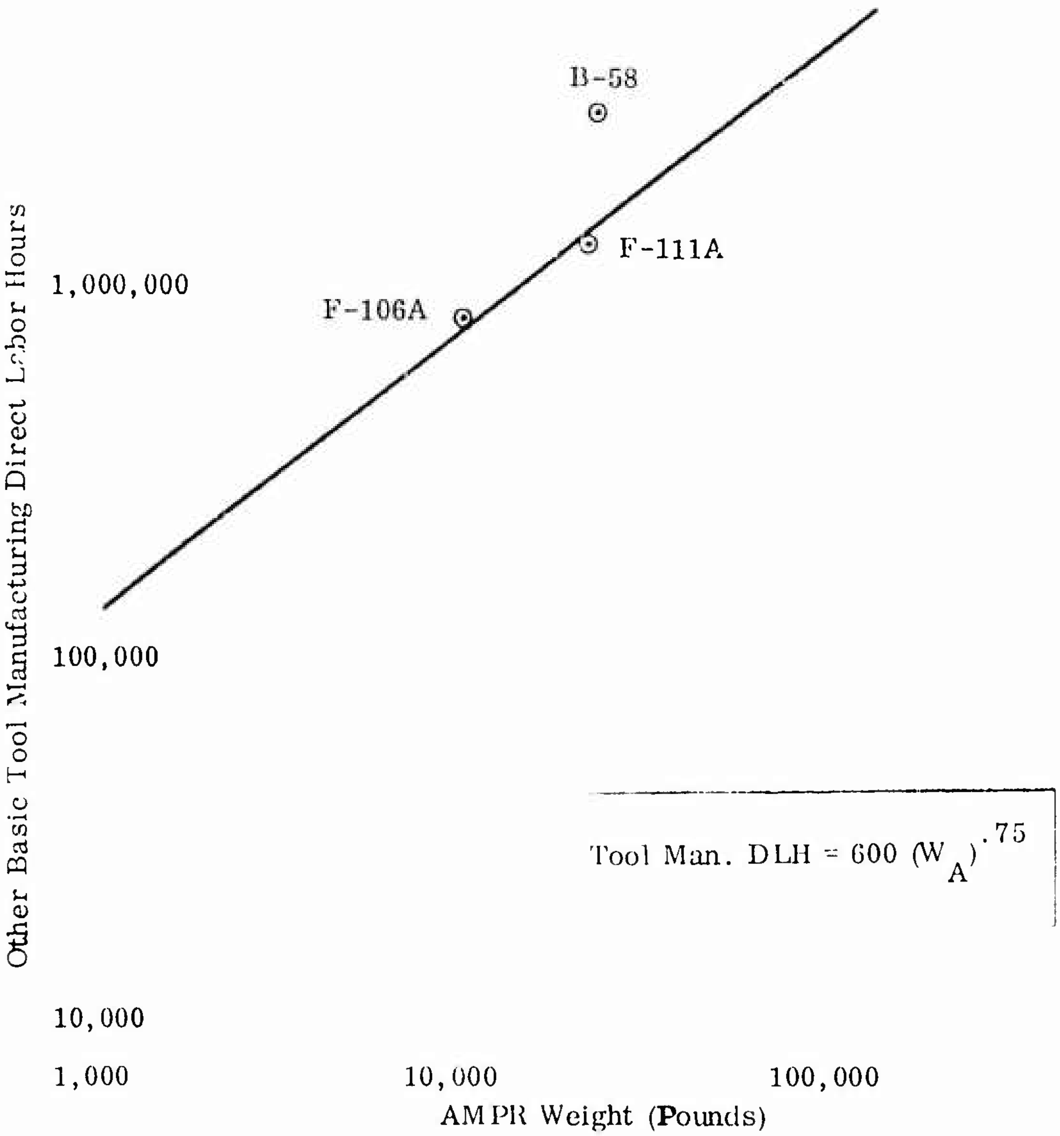


Figure L-13. Tool Manufacturing Cost Estimating Relationship - Functional Subsystems.

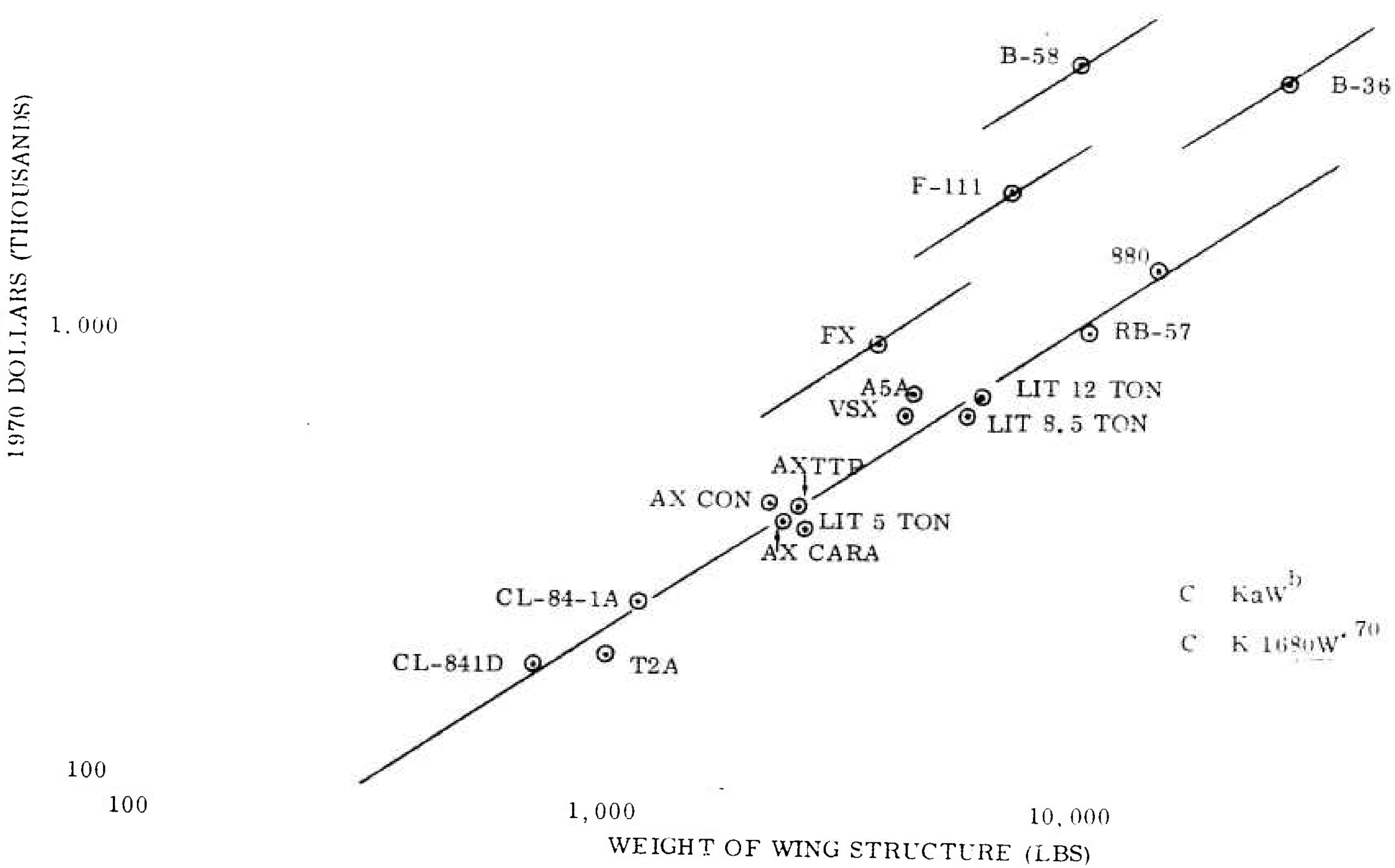
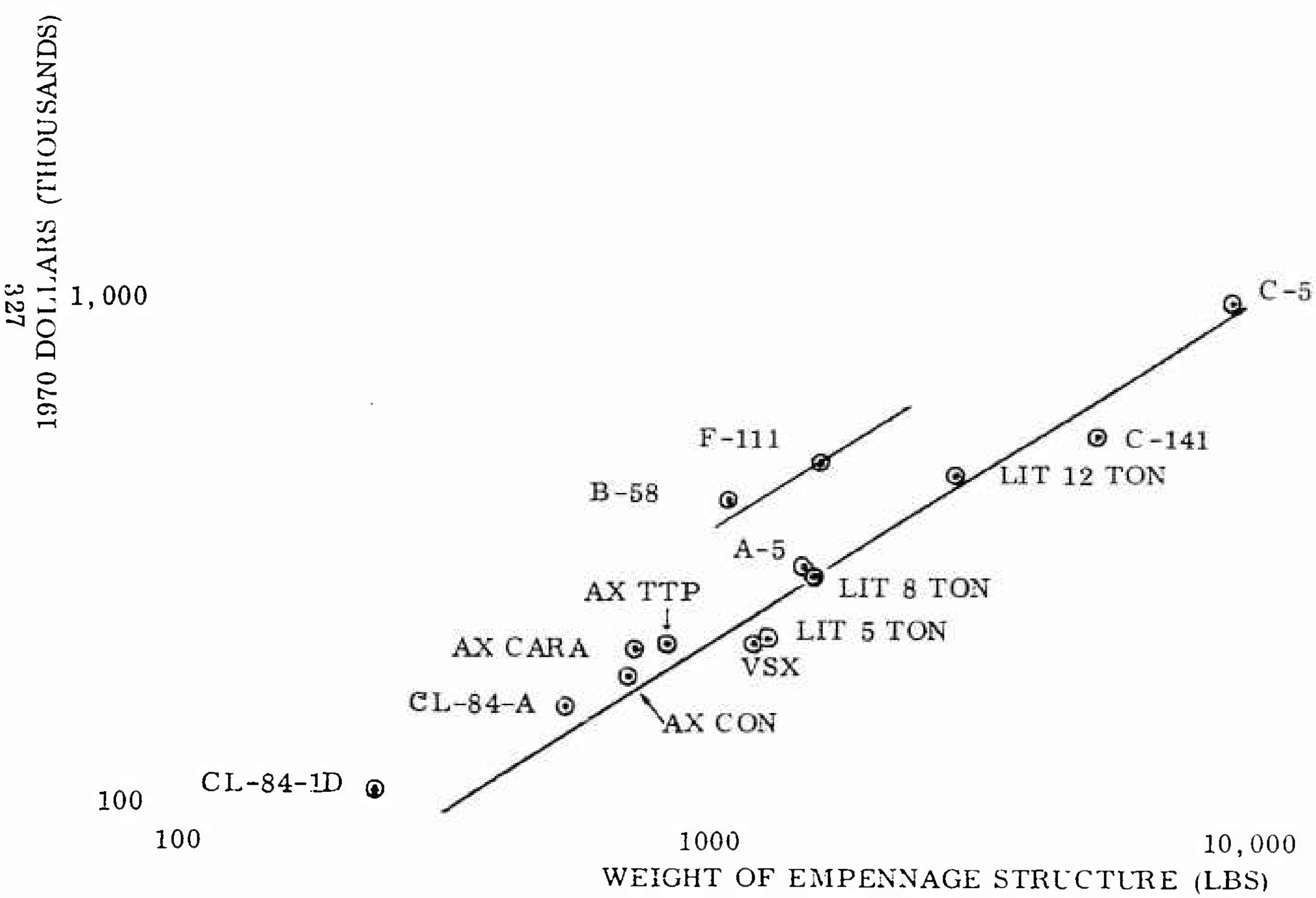


Figure L-14. Wing First Unit Cost (Labor and Material).



$C = KaW^b$

$C = K\ 2200W^{.65}$

Figure L-15. Empennage First Unit Cost (Labor and Material).

Blank, omitted intentionally

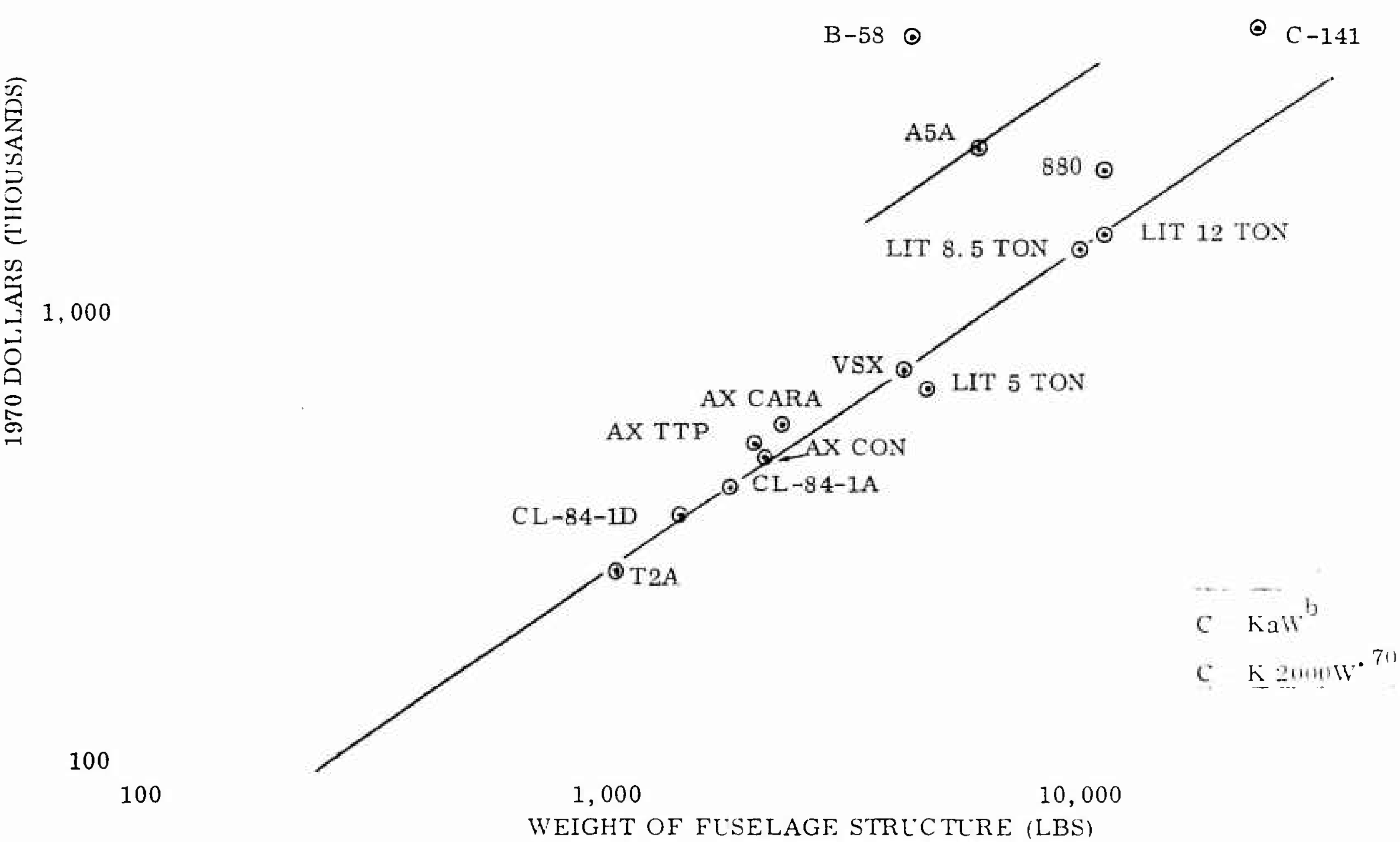


Figure L-17. Fuselage First Unit Cost (Labor and Material).

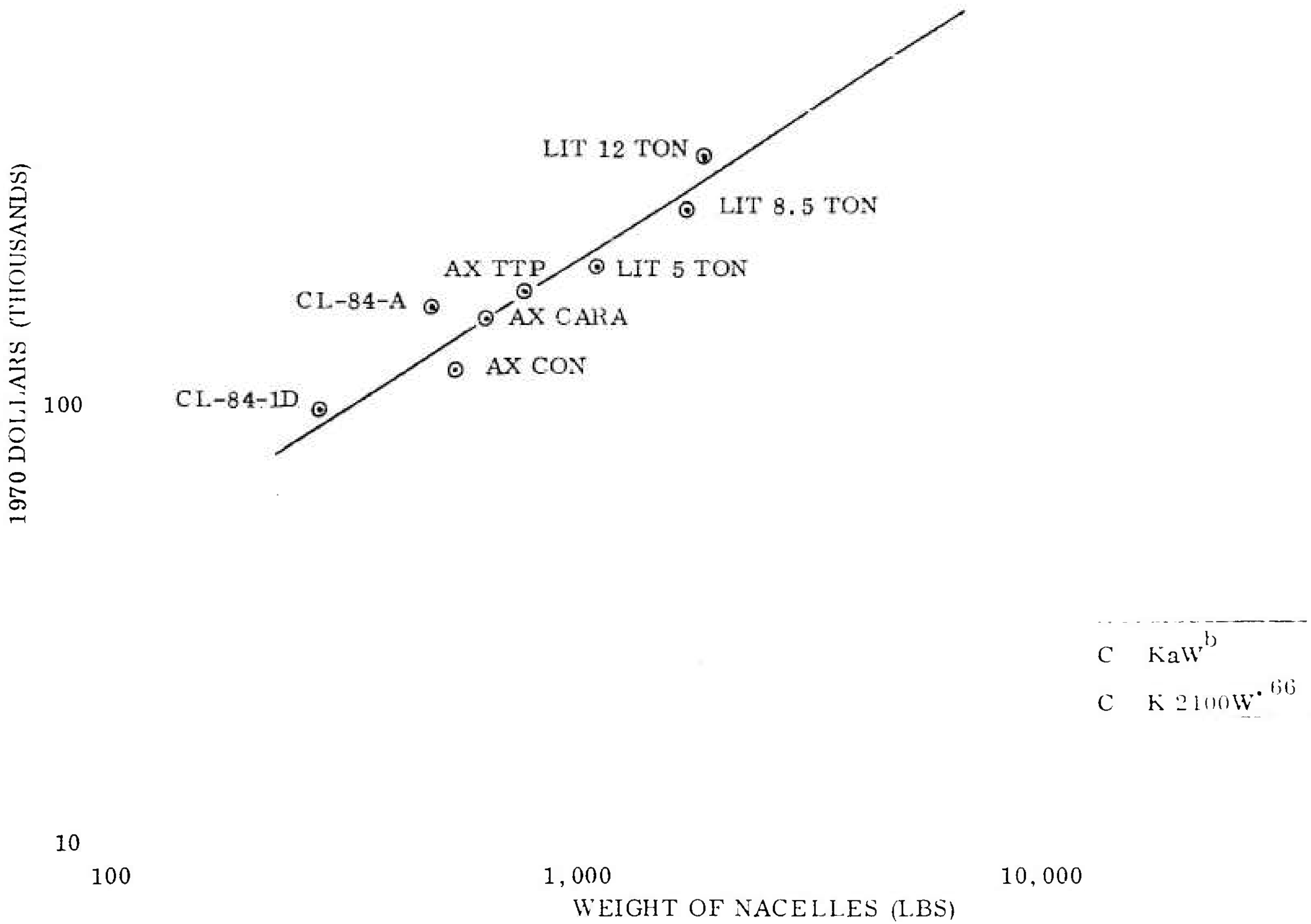


Figure L-18. Nacelles First Unit Cost (Labor and Material).

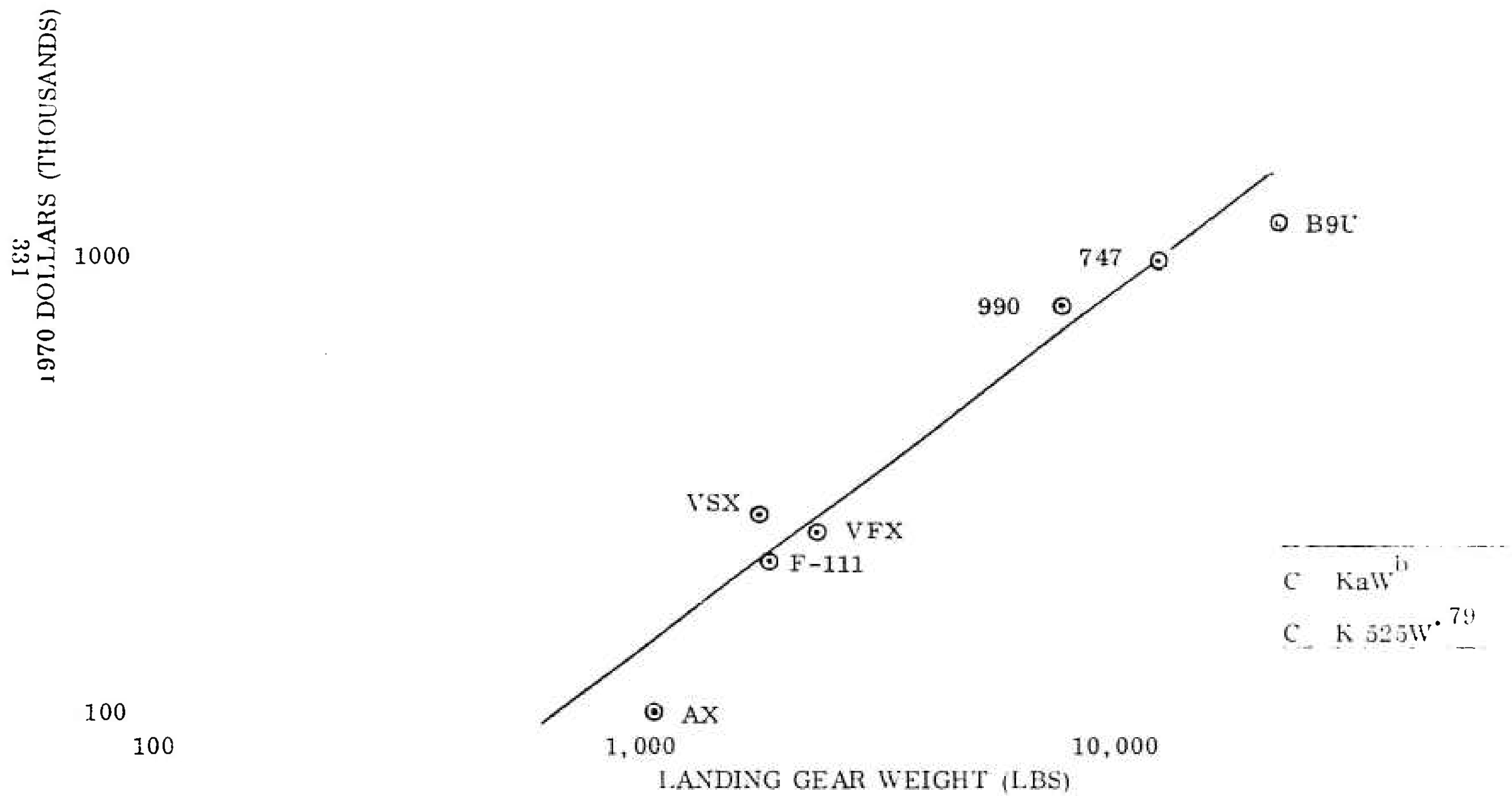


Figure L-19. Landing Gear First Unit Cost (Labor and Material).

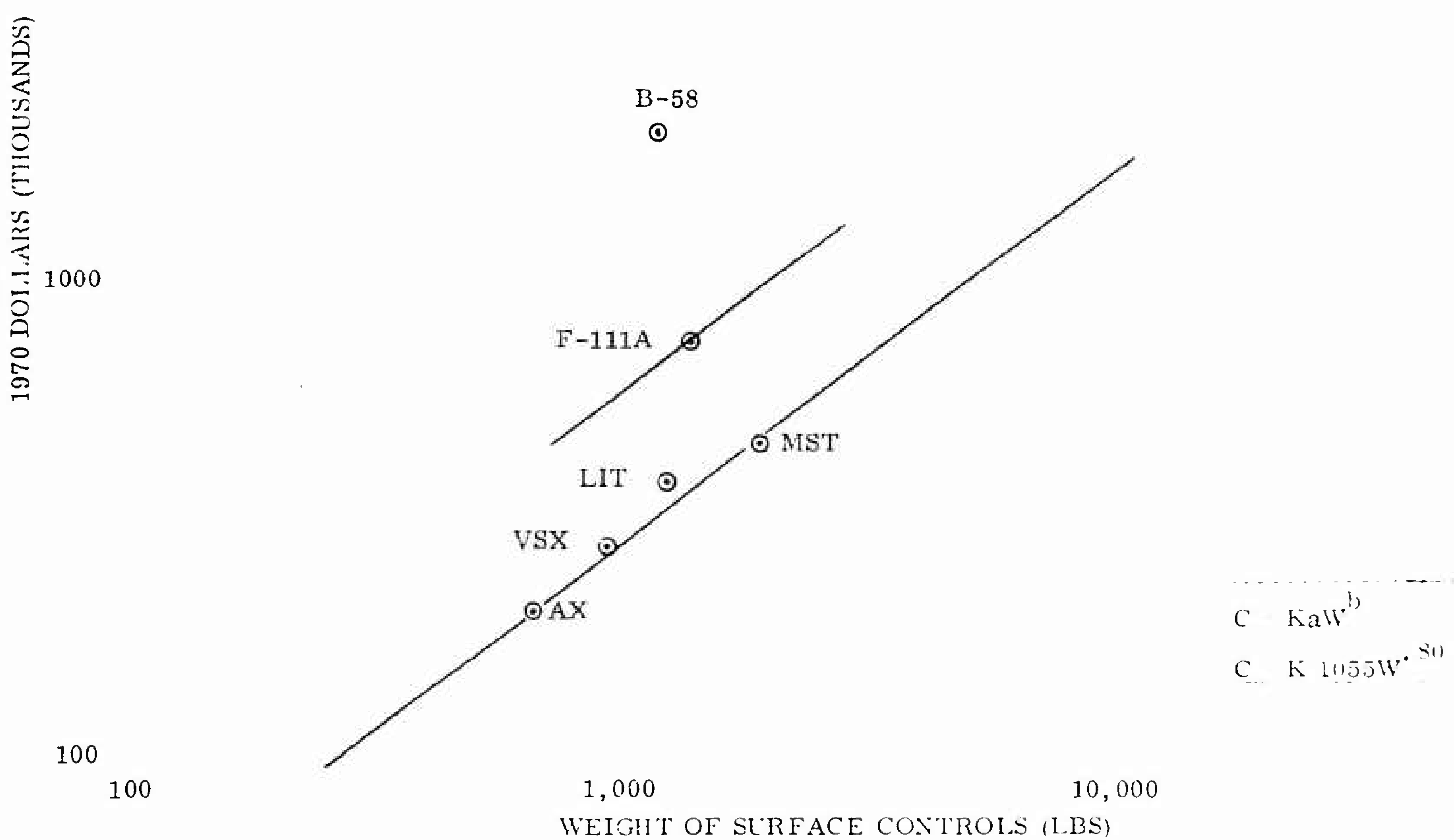


Figure L-20. Surface Controls First Unit Cost (Labor and Material).

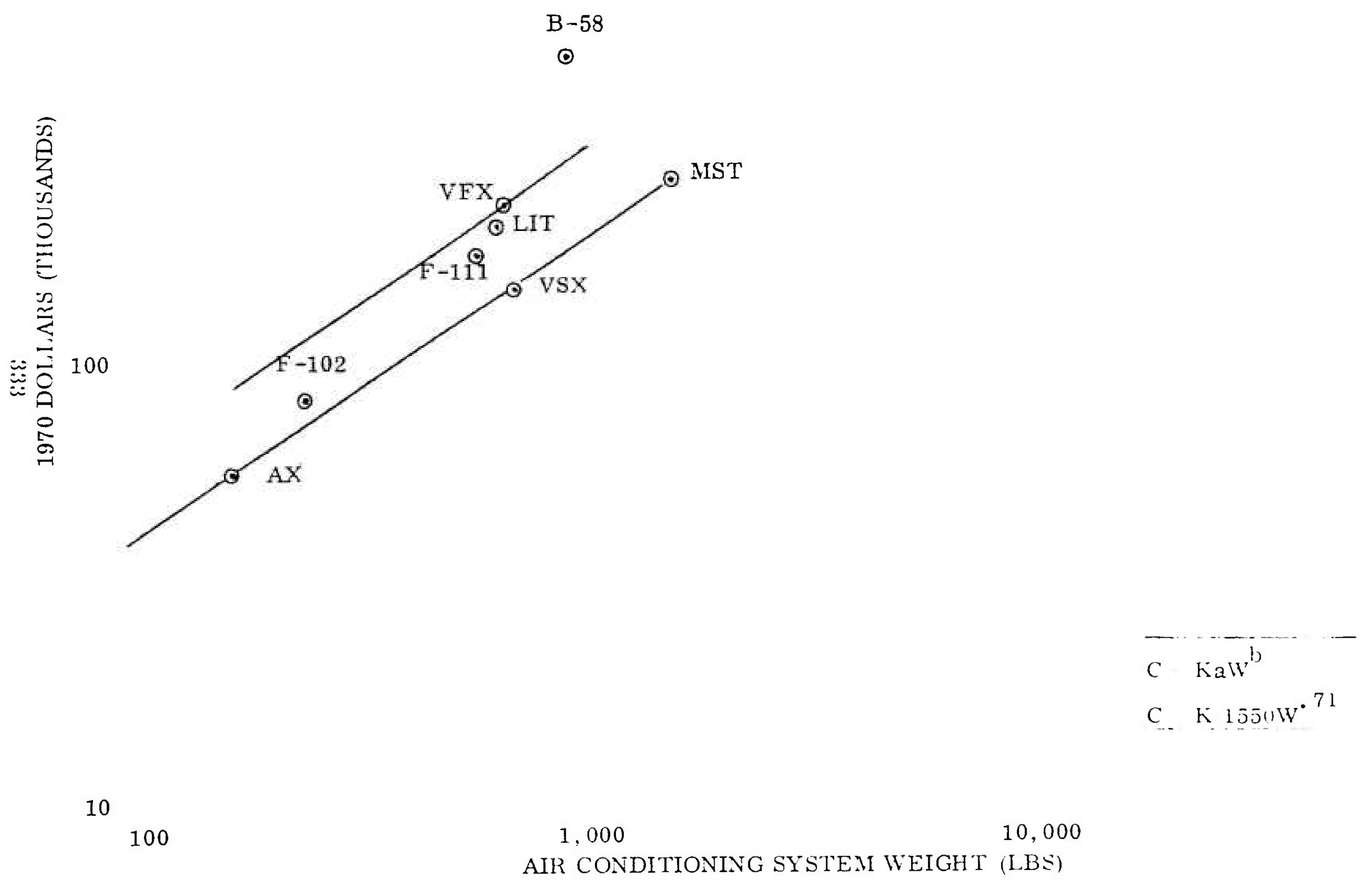


Figure L-21. Air Conditioning Subsystem First Unit Cost (Labor and Material).

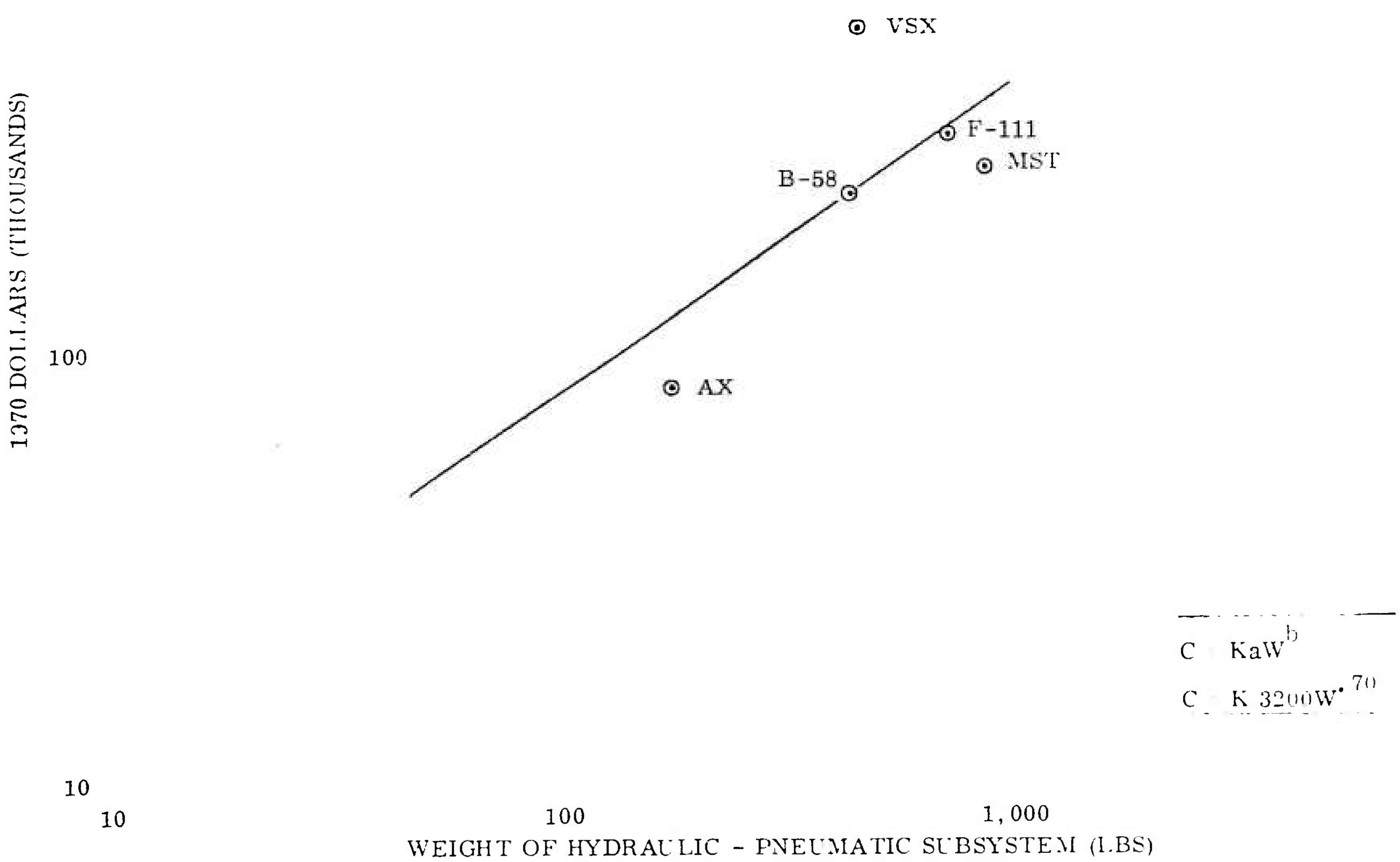


Figure L-22. Hydraulics - Pneumatics First Unit Cost (labor and Material).

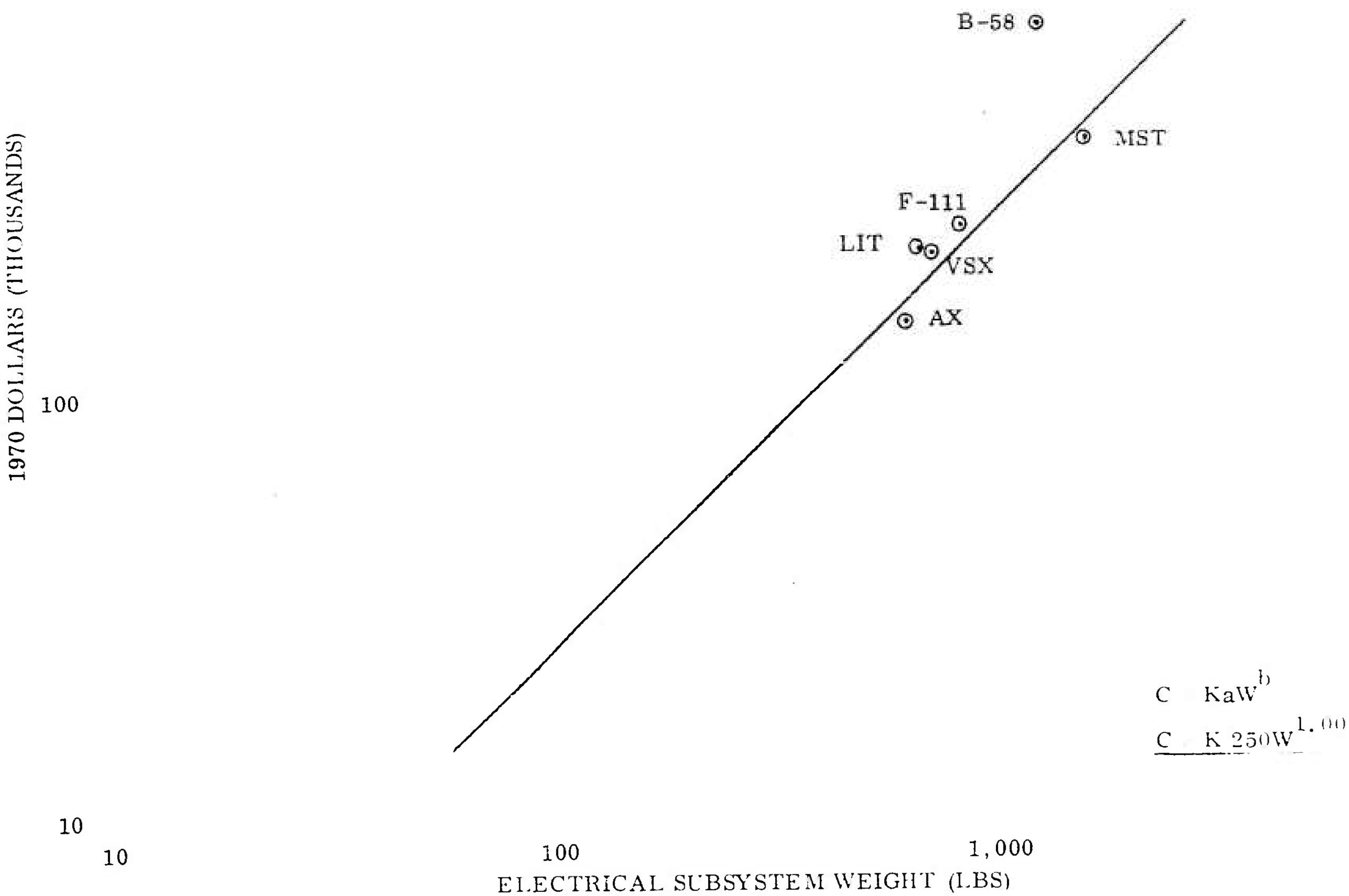


Figure L-23. Electrical Subsystem First Unit Cost (Labor & Material).

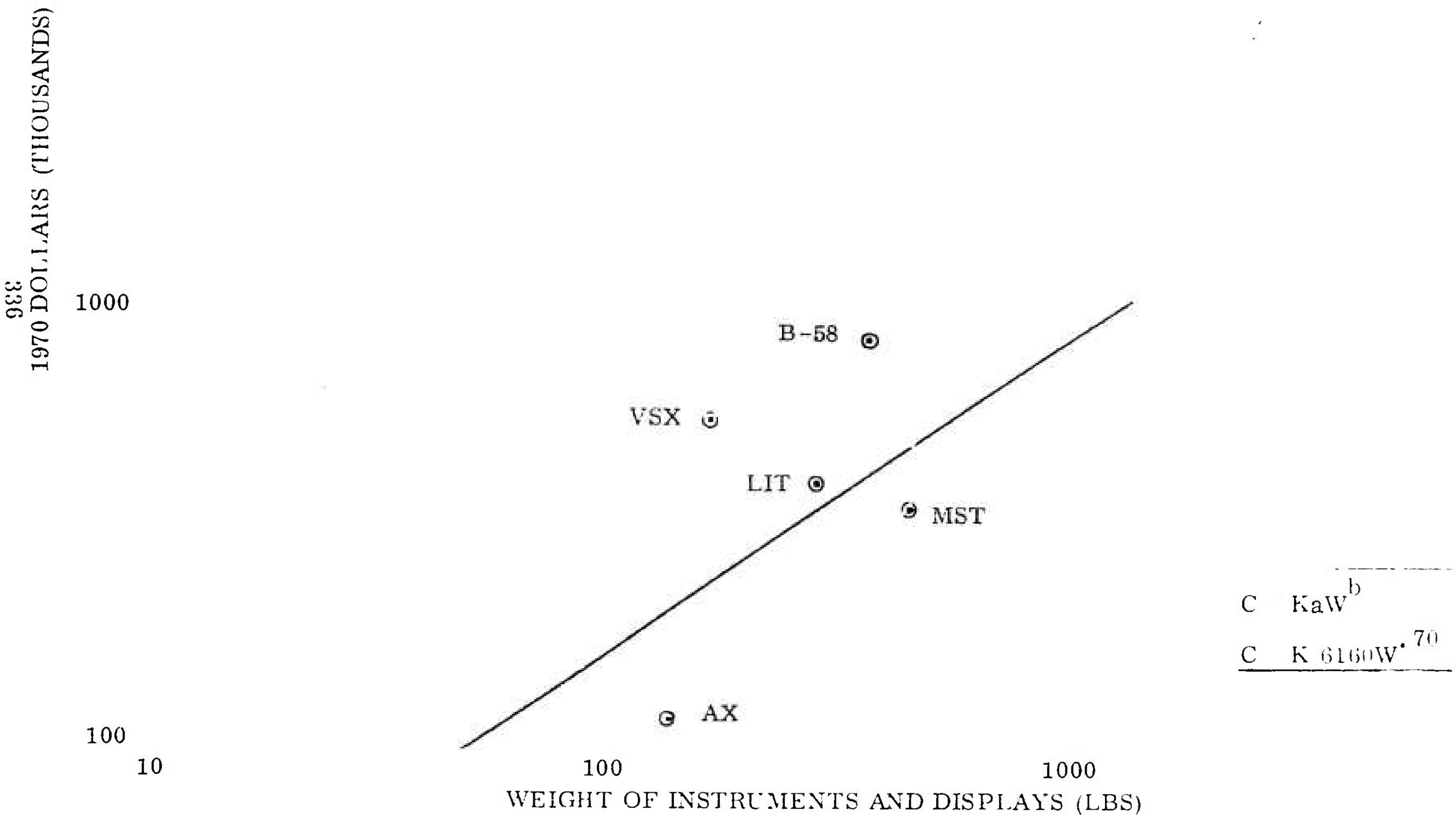


Figure L-24. Instruments and Displays First Unit Cost (Labor & Material).

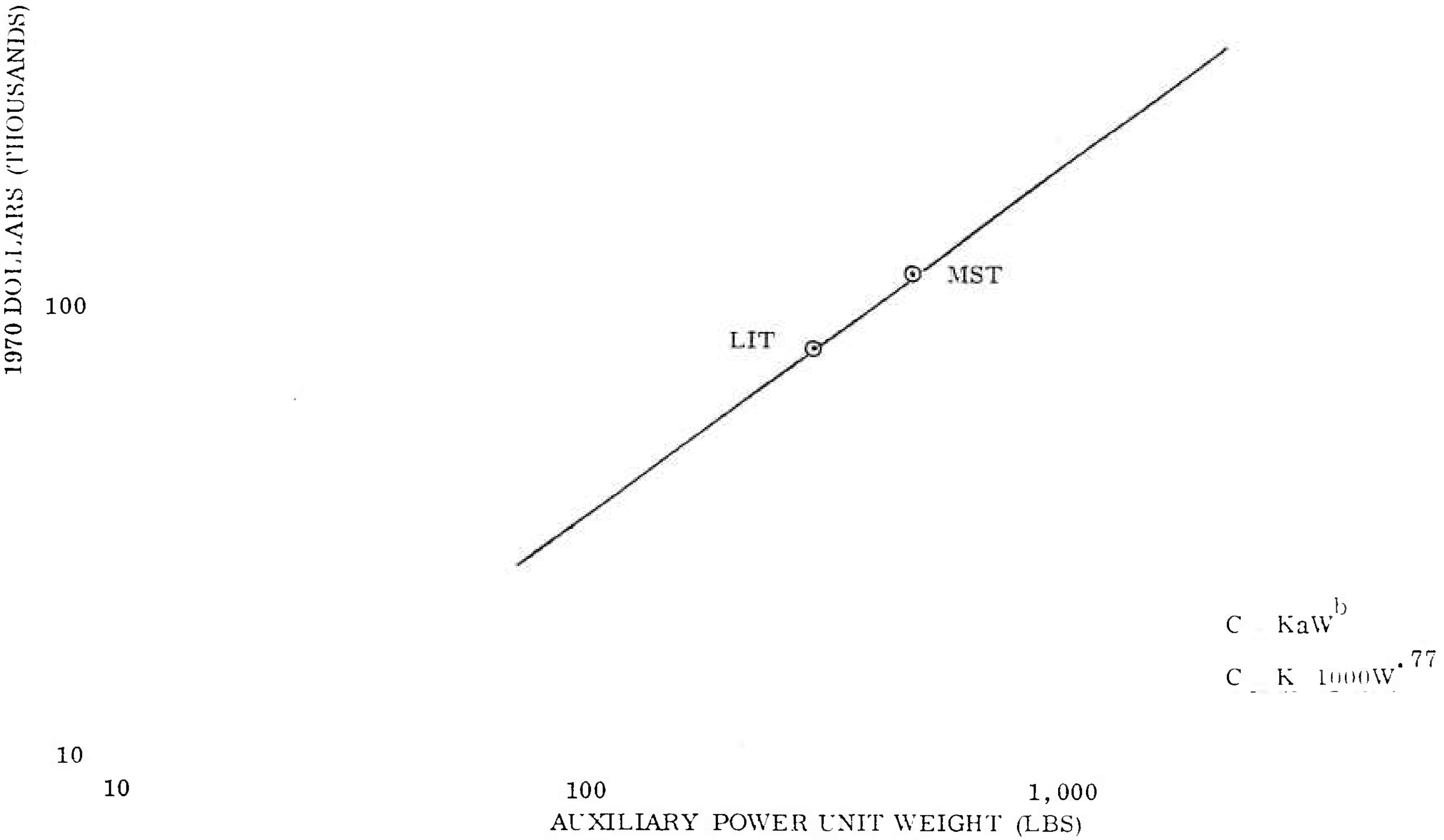


Figure L-25. Auxiliary Power First Unit Cost (Labor & Material).

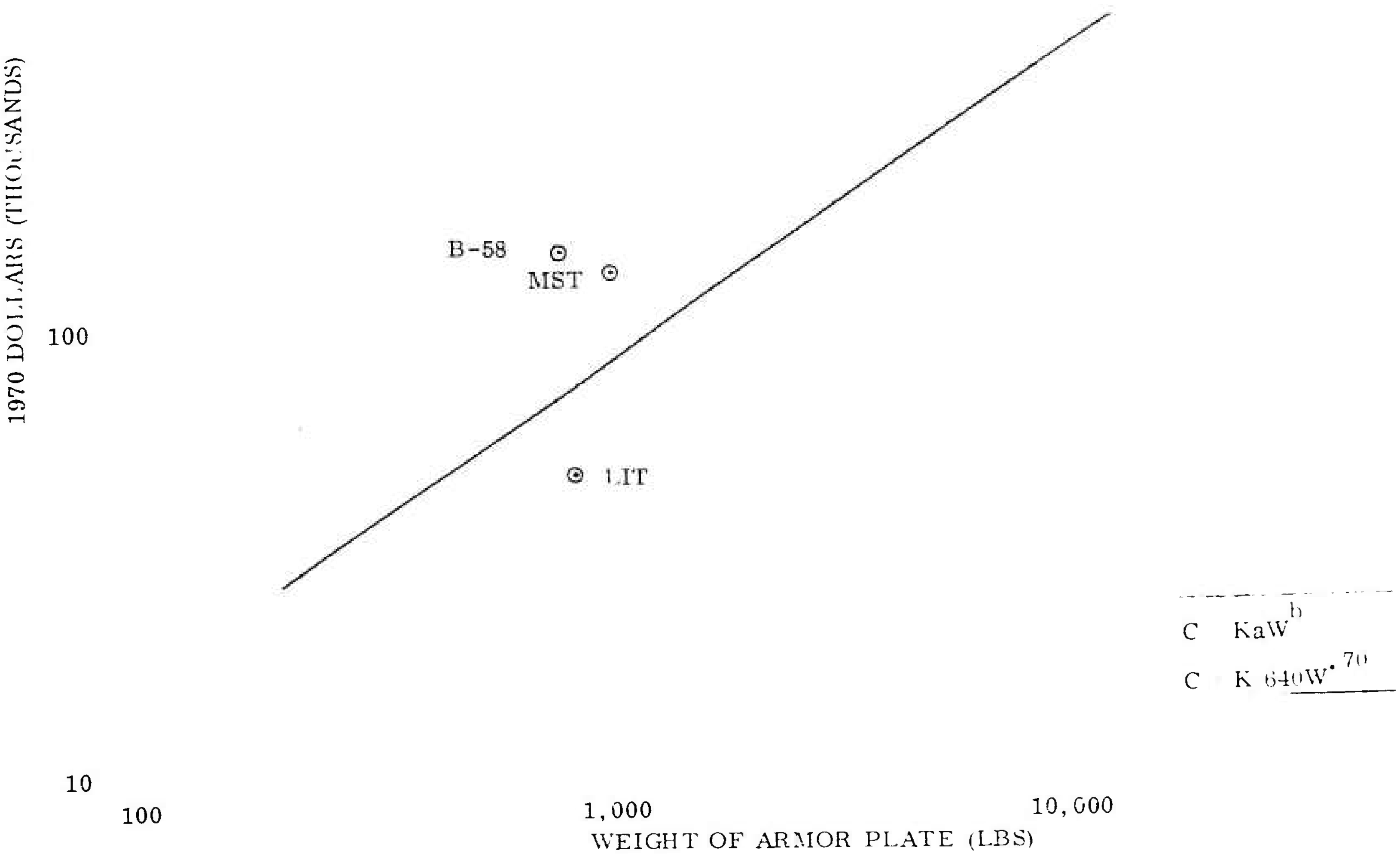


Figure L-26. Armor Plate First Unit Cost (Labor and Material).

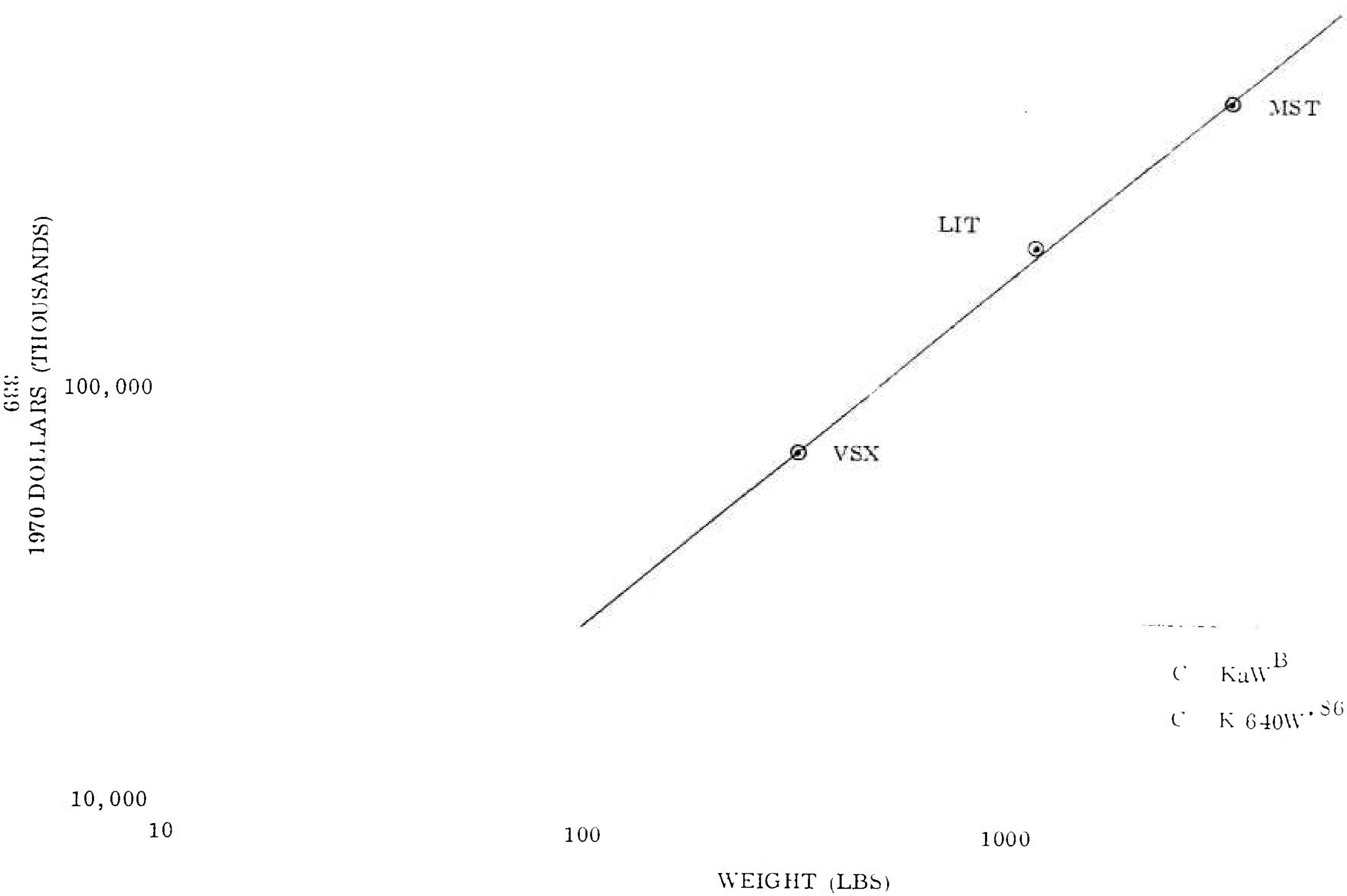


Figure L-27. Engine Associated Equipment First Unit Cost (Labor and Material).

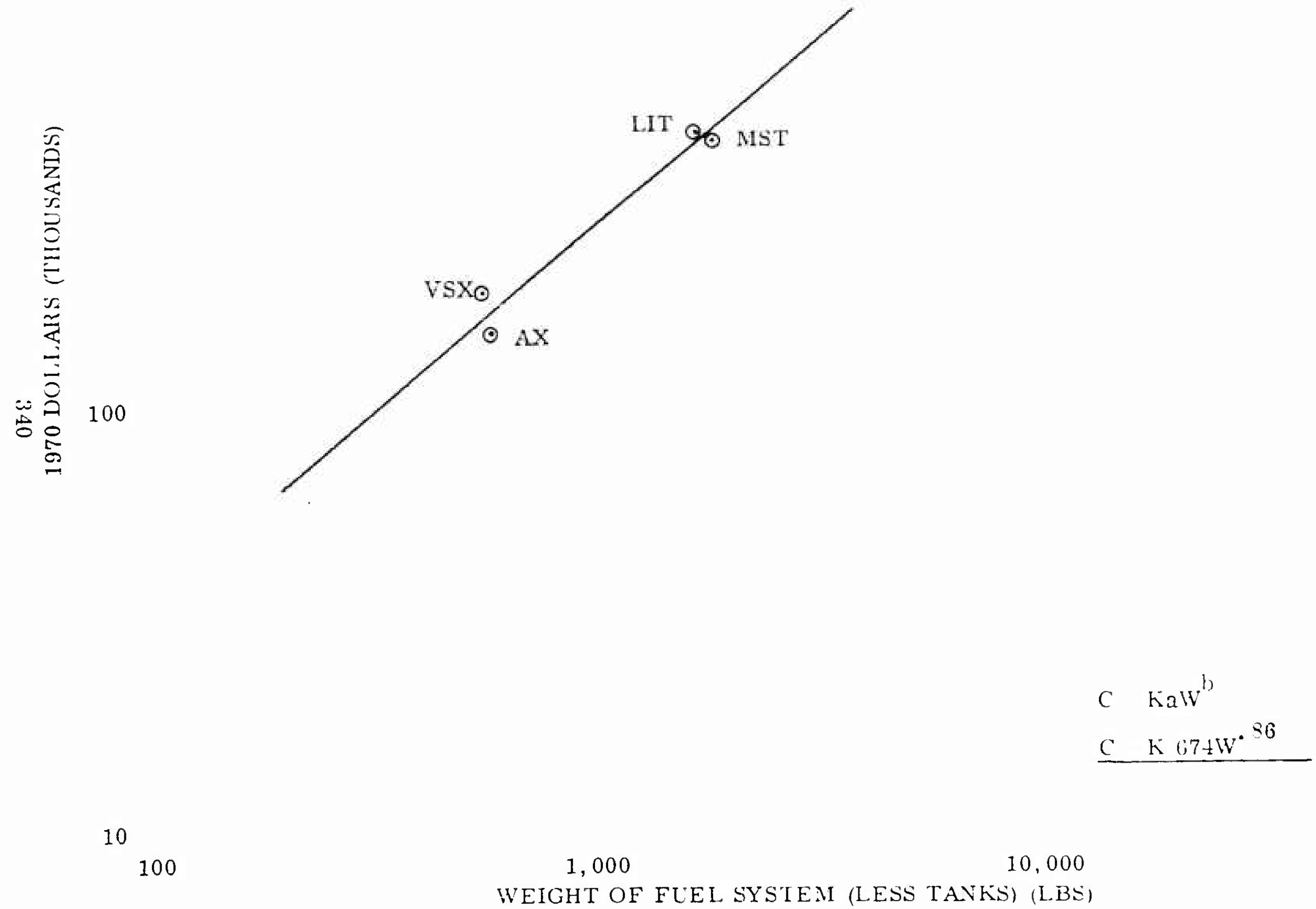


Figure L-28. Fuel System (Less Tanks) First Unit Cost (Labor and Material).

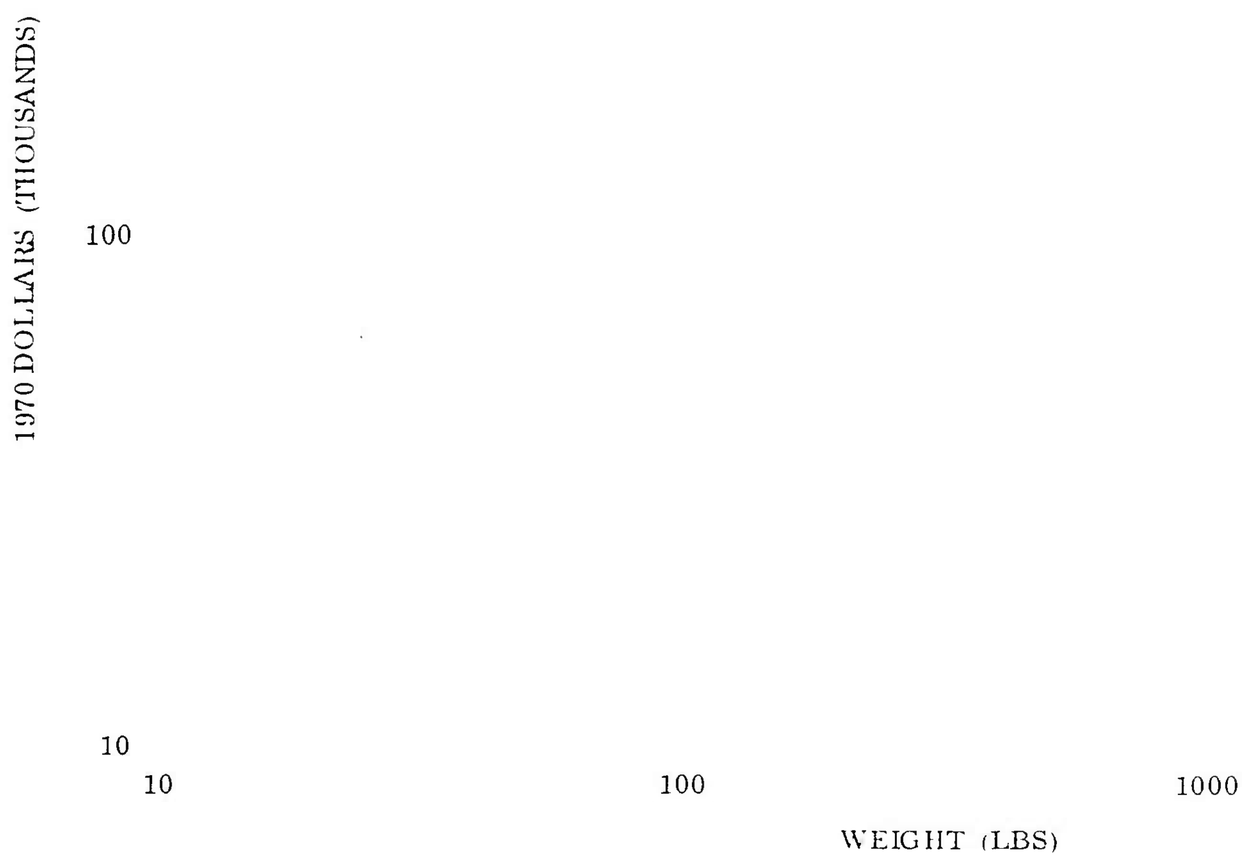


Figure L-29. Avionics Provisions First Unit Cost (Labor and Material).

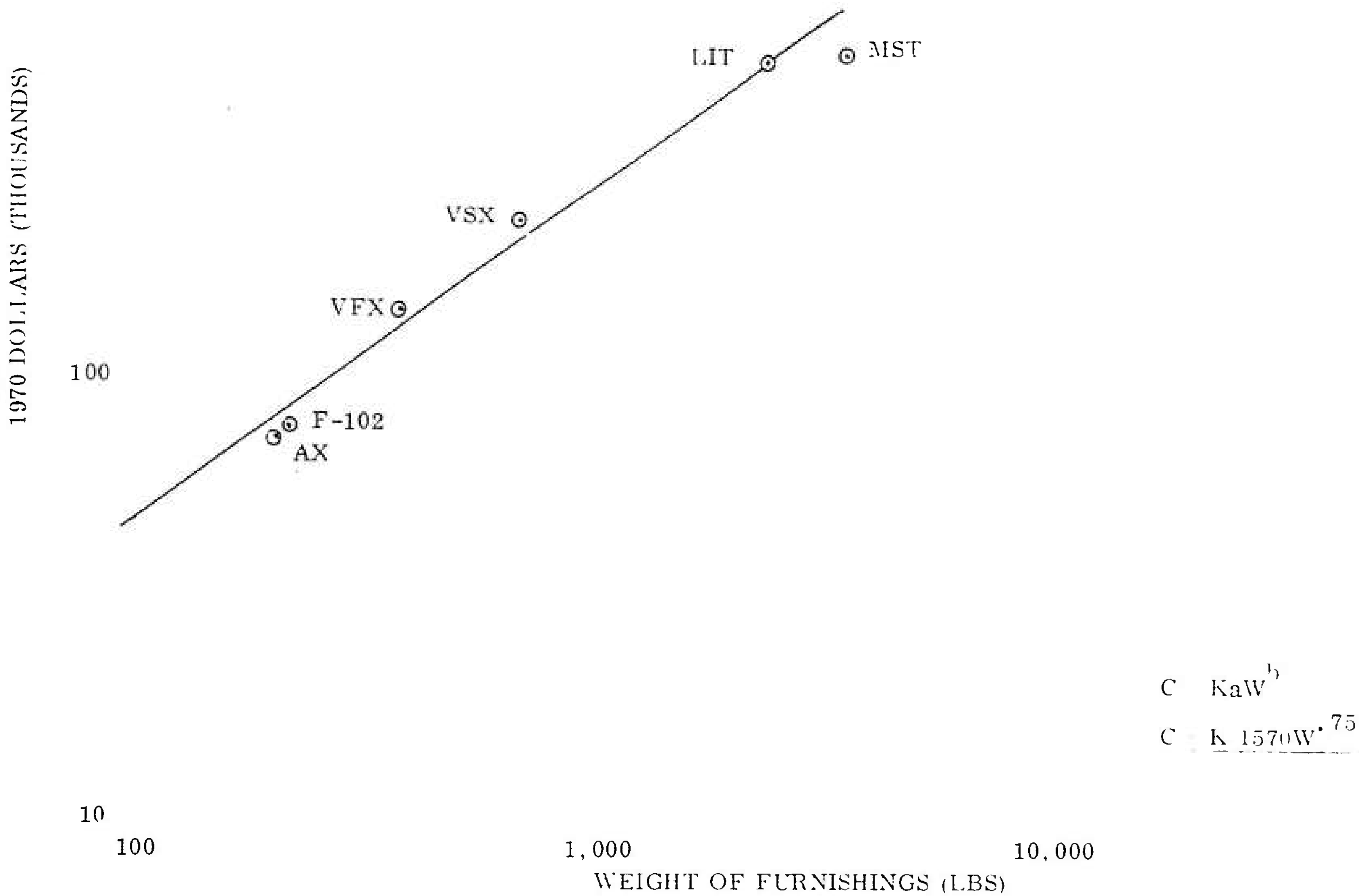


Figure L-30. Furnishings and Equipment First Unit Cost (Labor and Material).

APPENDIX M

TRADE STUDY DEMONSTRATION CASE

This appendix provides a summary that accounts for a complete set of output data from the trade study demonstration case. Several of the output printouts have been used for illustrative purposes. Table M-1 is provided to give the location of the complete set: those contained in this appendix plus those used previously for illustrative purposes.

Table M-1. Location of Trade Study Demonstration Case Estimating Results.

COST CATEGORY	LOCATION
First Unit Cost - Wing	Figure 2
First Unit Cost - Vertical Stabilizer	Figure 21
First Unit Cost - Fuselage	Figure 22
First Unit Cost - Nacelles	Figure 23
First Unit Cost - Landing Gear	Figure 24
RDT&E Costs - Wing	Figure 3
RDT&E Costs - Vertical Stabilizer	Figure M-1
RDT&E Costs - Fuselage	Figure M-2
RDT&E Costs - Nacelles	Figure M-3
RDT&E Costs - Landing Gear	Figure M-4
Recurring Production Costs - Wing	Figure M-5
Recurring Production Costs - Vertical Stabilizer	Figure M-6
Recurring Production Costs - Fuselage	Figure M-7
Recurring Production Costs - Nacelles	Figure M-8
Recurring Production Costs - Landing Gear	Figure M-9
Nonrecurring Design and Development Costs	Figure 5
Recurring Airframe Production Costs Summary	Figure 4

RDT+E COSTS 30

VERTICAL

17.28.46. 01/09/75

	DTAIL FAB HOURS	SUB-ASSY HOURS	MAJOR ASSY HOURS	PRIM-ASSY HOURS	MAJOR MATE HOURS	MATL COST $	TOTAL LABOR HOURS	TOTAL LABOR $	TOTAL $
STRUCTURAL BOX									
RIBS	5619	1598				15413			
SPARS	12297	2259				90745			
COVERS	23256	15222				108932			
ASSEMBLY			32344			136511			
STRUCTURAL BOX SUB-TOTALS	41172	19077	32344			350704			
LABOR COSTS ($)	258971	118497	190853						
SECONDARY STRUCTURE									
LEADING EDGE	20528	23475				54878			
TRAILING EDGE									
FAIRING	5052	4772				15295			
TIPS	7353	5515				9109			
ATTACHMENT STRUCTURE	11879	9561				37762			
ACCESS + OTHER DOOR	3472	4986				50267			
HINGES, BRACKETS, SEALS	3758	3157				17077			
RUDDER	25502	139749				103413			
ASSEMBLY			36648			112523			
SECONDARY STRUCTURE SUB-TOT	80535	187016	36648			400424			
LABOR COSTS ($)	506377	1175331	230515						
VERTICAL SUBTOTAL	121677	206094	68992			754128			
VERTICAL REWORK	12168	20609	6699			75413			
VERTICAL TOTAL	133845	226703	73691	34739	17370	829540			
LABOR COSTS ($)	841893	1425361	463515	218509	109254				
TOTALS							.4863	3.0591	3.8837

Figure M-1. RDT&E Costs - Vertical Stabilizer.

RDT+E COSTS 10

FUSELAGE

17.25.46. 01/09/75

	DTAIL FAB HOURS	SUB-ASSY HOURS	MAJOR ASSY HOURS	PRIM-ASSY HOURS	MAJOR MATE HOURS	MATL COST $	TOTAL LABOR HOURS	TOTAL LABOR $	TOTAL $
BASIC STRUCTURE									
FRAMES + BULKHEADS	210416	22357				650017			
LONGERONS	101374					506553			
SKINS + STRINGERS	139145	201244				1384707			
ASSEMBLY			697022			3183996			
BASIC STRUCTURE SUB-TOTALS	450937	223601	697022			5725269			
LABOR COSTS ($)	2836336	1406452	4384268						
SECONDARY STRUCTURE									
COCKPIT	58115	33901				67187			
NOSE LDG GEAR DOOR + BOX									
WING REACTION BOX									
TAIL ATTACHMENT									
WINDSHIELD + CANOPY	35501	45928				127115			
MAIN LDG GEAR DOOR + BOX									
FUEL PROVISIONS									
ENGINE PROVISIONS									
DUCT PROVISIONS									
STORES PROVISIONS	10718	10879				57067			
SPEED BRAKES									
CABIN FLOORING + SUPPORTS	59678	37293				.115			
WINDOWS + WINDOW FRAMES	5143	3357				.0111			
DOORS + DOOR FRAMES	35832	39390				.0975			
ASSEMBLY			118015			.3566			
SECONDARY STRUCTURE SUB-TOT	206048	171154	118015			.353			
LABOR COSTS ($)	1296042	1075560	742311						
FUSELAGE SUBTOTAL	656985	394755	815036			6.538			
FUSELAGE REWORK	65639	39476	81504			.659			
FUSELAGE TOTAL	722634	434231	896540	164275	32138	7.247			
LABOR COSTS ($)	4545582	2731314	5639237	1033299	516649				
TOTALS							2.2999	14.4662	21.71

Figure M-2. RDT&E Costs - Fuselage.

RDT+E COSTS 70

NACELLES

17.23.46. 01/03/75

	DTAIL FAB HOURS	SUB-ASSY HOURS	MAJOR ASSY HOURS	PRIM-ASSY HOURS	MAJOR MATE HOURS	MATL COST $	TOTAL LABOR HOURS	TOTAL LABOR $	TOTAL $
COWLING	353223	184203				1495392			
PYLON	152226	75709				655137			
MAIN LDG GEAR DOORS + REINFORC ASSEMBLY			361993						
NACELLES SUB-TOTALS	505449	259912	361994			2150529			
LABOR COSTS ($)	3173274	1634047	2274337						
NACELLES REWORK	50545	25991	36199			215053			
NACELLES TOTAL	555994	285903	398193	99159	49599	2365581			
LABOR COSTS ($)	3497202	1798332	2503475	623960	311983				
TOTALS							1.3893	3.7354	11.1017

Figure M-3. RDT&E Costs - Nacelles.

RDT+E COSTS 30

LANDING GEAR

17.28.45. 01/03/75

	DTAIL FAB HOURS	SUB-ASSY HOURS	MAJOR ASSY HOURS	PRIM-ASSY HOURS	MAJOR MATE HOURS	MATL COST $	TOTAL LABOR HOURS	TOTAL LABOR $	TOTAL $
BRAKES		1739				1088039			
BRAKE CONTROLS		579				307497			
WHEELS		336				303685			
TIRES						955495			
OLEOS		2550				1882104			
AXLES, TRUNNIONS + FITTINGS		427				1765672			
DRAG BRACES	2103	3155				472537			
ASSEMBLY			8953						
LANDING GEAR SUB-TOTALS	2103	9035	8953			6582030			
LABOR COSTS (3)	13229	56531	56312						
LANDING GEAR REWORK	210	904	895			658203			
LANDING GEAR TOTAL	2314	9939	9849	1769	884	7240233			
LABOR COSTS (3)	14552	62514	61944	11121	5560				
TOTALS							24752	155690	7395923
AIRFRAME STRUCTURE TOTAL	2.5136	1.7149	2.0937	.5057	.2529	24.391			
AIRFRAME LABOR TOTAL (3)	15.8103	10.7314	13.1691	3.1809	1.5904				

Figure M-4. RDT&E Costs - Landing Gear

RECURRING PRODUCTION COSTS 96

WING

17.28.46. 01/09/75

	DTAIL FAB HOURS	SUB-ASSY HOURS	MAJOR ASSY HOURS	PRIM-ASSY HOURS	MAJOR MATE HOURS	MAT'L COST $	TOTAL LABOR HOURS	TOTAL LABOR $	TOTAL $
STRUCTURAL BOX									
RIBS	.0463	.0107				.3041			
SPARS	.0948	.0645				1.8755			
COVERS	.1137	.0777				3.2397			
ASSEMBLY			.4042			4.3339			
STRUCTURAL BOX SUB-TOTALS	.2548	.1529	.4042			10.3053			
LABOR COSTS ($)	1.6030	.9616	2.5424						
SECONDARY STRUCTURE									
LEADING EDGE	.0431	.0490				.3466			
TRAILING EDGE	.0244	.0213				.1380			
AILERONS	.4302	.2511				.9460			
FAIRINGS	.0834	.0729				.6805			
TIPS	.0638	.0517				.2913			
SPOILERS									
FLAPS + FLAPERONS									
ATTACHMENT STRUCTURE	.0120	.0568				.2126			
ACCESS + OTHER DOORS	.0154	.0331				.6434			
AIR INDUCTION									
HIGH LIFT DUCTING									
SLATS									
HINGES, BRACKETS, SEALS									
PIVOTS + FOLDS									
CENTER SECTION									
OTHER	.1596	.0303				1.0062			
ASSEMBLY			.3015			2.1786			
SECONDARY STRUCTURE SUB-TOT	.8288	.6265	.3015			6.3826			
LABOR COSTS ($)	5.2131	3.9412	1.8963						
WING SUBTOTAL	1.0836	.7795	.7057			16.6880			
WING REWORK	.1094	.0779	.0706			1.6688			
WING TOTAL	1.1930	.8574	.7762	.2261	.1130	18.3568			
LABOR COSTS ($)	7.4977	5.3931	4.6825	1.4219	.7109				
TOTALS							3.1647	19.9061	38.2629

Figure M-5. Recurring Production Costs - Wing.

RECURRING PRODUCTION COSTS 96

VERTICAL

17.28.46. 01/09/75

	DTAIL FAB HOURS	SUB-ASSY HOURS	MAJOR ASSY HOURS	PRIM-ASSY HOURS	MAJOR MATE HOURS	MATL COST $	TOTAL LABOR HOURS	TOTAL LABOR $	TOTAL $
STRUCTURAL BOX									
RIBS	.0061	.0017				.0393			
SPARS	.0133	.0024				.2311			
COVERS	.0252	.0165				.2774			
ASSEMBLY			.0329			.3530			
STRUCTURAL BOX SUB-TOTALS	.0447	.0207	.0329			.9007			
LABOR COSTS ($)	.2910	.1302	.2071						
SECONDARY STRUCTURE									
LEADING EDGE	.0223	.0222				.1398			
TRAILING EDGE									
FAIRING	.0055	.0052				.0390			
TIPS	.0030	.0060				.0232			
ATTACHMENT STRUCTURE	.0128	.0096				.0462			
ACCESS + OTHER DOOR	.0078	.0054				.1780			
HINGES, BRACKETS, SEALS	.0041	.0034				.0435			
RUDDER	.0319	.3546				.2633			
ASSEMBLY			.0398			.2868			
SECONDARY STRUCTURE SUB-TOT	.0873	.4064	.0398			1.0197			
LABOR COSTS ($)	.5494	2.5565	.2501						
VERTICAL SUBTOTAL	.0873	.4064	.0727			1.3727			
VERTICAL REWORK	.0087	.0405	.0073			.1373			
VERTICAL TOTAL	.0961	.4471	.0799	.0498	.0249	1.5100			
LABOR COSTS ($)	.5343	2.6121	.5029	.3135	.1568				
TOTALS							.6979	4.3896	5.8995

Figure M-6. Recurring Production Costs - Vertical Stabilizer.

RECURRING PRODUCTION COSTS 36

FUSELAGE

17.28.46. 01/09/75

	DTAIL FAB HOURS	SUB-ASSY HOURS	MAJOR ASSY HOURS	PRIM-ASSY HOURS	MAJOR MATE HOURS	MATL COST $	TOTAL LABOR HOURS	TOTAL LABOR $	TOTAL
BASIC STRUCTURE									
FRAMES + BULKHEADS	.228	.024				1.66			
LONGERONS	.110					1.29			
SKINS + STRINGERS	.151	.219				3.53			
ASSEMBLY			.756			3.11			
BASIC STRUCTURE SUB-TOTALS	.489	.243	.755			14.58			
LABOR COSTS ($)	3.077	1.525	4.757						
SECONDARY STRUCTURE									
COCKPIT	.063	.037				.22			
NOSE LDG GEAR DOOR + BOX									
WING REACTION BOX									
TAIL ATTACHMENT									
WINDSHIELD + CANOPY	.039	.050				.32			
MAIN LDG GEAR DOOR + BOX									
FUEL PROVISIONS									
ENGINE PROVISIONS									
DUCT PROVISIONS									
STORES PROVISIONS	.012	.012				.15			
SPEED BRAKES									
CABIN FLOORING + SUPPORTS	.065	.040				.3			
WINDOWS + WINDOW FRAMES	.006	.004				.03			
DOORS + DOOR FRAMES	.040	.043				.25			
ASSEMBLY			.128			.93			
SECONDARY STRUCTURE SUB-TOT	.224	.186	.128			2.2			
LABOR COSTS ($)	1.406	1.168	.805						
FUSELAGE SUBTOTAL	.713	.428	.884			15.8			
FUSELAGE REWORK	.071	.043	.088			1.7			
FUSELAGE TOTAL	.784	.471	.973	.178	.089	13.5			
LABOR COSTS ($)	4.932	2.963	6.113	1.121	.561				
TOTALS							2.495	15.694	34.1

Figure M-7. Recurring Production Costs - Fuselage.

RECURRING PRODUCTION COSTS 86

NACELLES

17.28.46. 01/09/75

	DTAIL FAB HOURS	SUB-ASSY HOURS	MAJOR ASSY HOURS	PRIM-ASSY HOURS	MAJOR MATE HOURS	MATL COST $	TOTAL LABOR HOURS	TOTAL LABOR $	TOTAL $
COWLING	.3832	.1998				3.8081			
PYLON	.1652	.0321				1.6684			
MAIN LDG GEAR DOORS + REINFORC ASSEMBLY			.3925						
NACELLES SUB-TOTALS	.5484	.2527	.3926			5.4765			
LABOR COSTS ($)	3.4432	1.7737	2.4695						
NACELLES REWORK	.0548	.0282	.0393			.5476			
NACELLES TOTAL	.6032	.3102	.4319	.1075	.0539	6.0241			
LABOR COSTS ($)	3.7941	1.9510	2.7166	.6763	.3385				
TOTAL							1.5067	9.4771	15.5012

Figure M-8. Recurring Production Costs - Nacelles.

RECURRING PRODUCTION COSTS 55

LANDING GEAR

17.28.46. 01/09/75

	DTAIL FAB HOURS	SUB-ASSY HOURS	MAJOR ASSY HOURS	PRIM-ASSY HOURS	MAJOR MATE HOURS	MATL COST $	TOTAL LABOR HOURS	TOTAL LABOR $	TOTAL $
BRAKES		.0019				2.7708			
BRAKE CONTROLS		.0006				.7331			
WHEELS		.0004				2.0519			
TIRES						2.4358			
OLEOS		.0030				4.7329			
AXLES, TRUNNIONS + FITTINGS		.0005				2.7138			
DRAG BRACES	.0023	.0034				1.2034			
ASSEMBLY			.0097						
LANDING GEAR SUB-TOTALS	.0023	.0098	.0097			16.7615			
LABOR COSTS ($)	.0144	.0617	.0611						
LANDING GEAR REWORK	.0002	.0010	.0010			1.6762			
LANDING GEAR TOTAL	.0025	.0108	.0107	.0019	.0010	18.4378			
LABOR COSTS ($)	.0158	.0678	.0672	.0121	.0060				
TOTALS							.0269	.1689	18.6057
AIRFRAME STRUCTURE TOTAL	2.68	2.10	2.27	.56	.28	62.8			
AIRFRAME LABOR TOTAL ($)	16.84	13.19	14.29	3.55	1.77				

Figure M-9. Recurring Production Costs - Landing Gear.

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